Community-Acquired Pneumonia: Hospital Outcomes in California, 2003 - 2005

oshpd

California Hospital Outcomes Program Report 2008

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Community-Acquired Pneumonia: Hospital Outcomes in California, 2003-2005

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Executive Summary

With the release of "Community-Acquired Pneumonia: Hospital Outcomes in California, 2003-2005," the Office of Statewide Health Planning and Development (OSHPD) provides the third report on community-acquired pneumonia (CAP) outcomes for California hospitals. The report is based on analysis of Patient Discharge Data (PDD) records submitted to OSHPD by California-licensed acute care hospitals. The CAP patients were admitted to the hospital between January 2003 and November 2005.

The quality of hospital performance was assessed by comparing each hospital's risk-adjusted death rate (RADR) for CAP patients with the statewide rate. Taking into account patients' severity of illness prior to admission allows a fair comparison of each hospital's death rate with the statewide rate and with other hospitals.

In previous CAP reports issued by OSHPD, quality ratings of hospital performance were based on the results of two risk-adjustment models; one included "Do Not Resuscitate" (DNR) orders as a risk factor and the other did not. Hospitals were rated "better than expected" if they had significantly lower death rates using both models or "worse than expected" if their death rates were significantly higher using both models.

In this report, DNR was not included as a risk factor (see section "Changes to 2003-2005 CAP Report"). Hospitals were rated as "better than expected" or "worse than expected" based on the results of a single risk-adjustment model that did not include DNR. This method for comparing risk-adjusted hospital death rates to the statewide rate was less restrictive. As a result, a larger number of hospitals were rated "better than expected" (48) and "worse than expected" (47) than in previous reports.

Key findings for this report:

Between January 2003 and November 2005, a total of 208,837 patients (age 18 and above) were admitted to California hospitals with a diagnosis of community-acquired pneumonia. Within 30 days of admission 25,389 of these patients (12.2%) died either in the hospital or following discharge.

- A total of 384 hospitals reported CAP cases for this time period. Of these, 30 hospitals had fewer than 30 CAP cases and were excluded from the analysis. Quality ratings were calculated for the remaining 354 hospitals, and their risk-adjusted death rates (RADRs) ranged from 5.4% to 21.9%.

- For the 48 hospitals rated "better than expected," the average risk-adjusted death rate was 8.2%. Rates ranged from 5.4% to 10.3%. For the 47 hospitals rated "worse than expected," the average adjusted death rate was more than twice as high at 16.7%. The risk-adjusted death rate for these hospitals ranged from 14.0% to 21.9%.

- Respiratory failure at the time of hospital admission proved the strongest predictor of death for these patients, increasing the risk of dying five-fold. Patients with lung cancer or septicemia had a death rate three times higher. For patients with certain cancers or blood coagulation problems, the rate was nearly twice as high.

Such a large disparity in patient outcomes, after accounting for the severity of illness in each hospital's patients, suggests that there were important differences in the clinical practices of these two groups of hospitals.

All hospitals caring for CAP patients should implement the “best practices” guidelines supported by the medical community. Hospitals with poor outcomes should review their clinical practices to identify and correct shortcomings.

The hospitals with “better than expected” and “worse than expected” death rates for CAP patients are as follows:

Hospitals with "Better than Expected" (Lower) Death Rates	Hospitals with "Worse than Expected" (Higher) Death Rates
Alhambra Hospital	Anaheim General Hospital
Alta Bates Summit Med Center – Summit Campus-Hawthorne	Anaheim Memorial Medical Center
Beverly Hospital	Bakersfield Memorial Hospital – 34th Street
California Pacific Med Center – Pacific Campus	Coast Plaza Doctors Hospital
Cedars Sinai Medical Center	Community Medical Center – Clovis
Community And Mission Hospital of Huntington Park – Slauson	Community Medical Center – Fresno
Daniel Freeman Memorial Hospital	Corona Regional Medical Center-Main
East Los Angeles Doctors Hospital	Dameron Hospital
El Camino Hospital	Desert Regional Medical Center
Feather River Hospital	Emanuel Medical Center, Inc.
Fountain Valley Regional Hosp and Med Center-Euclid	Fairchild Medical Center
Garfield Medical Center	Hemet Valley Medical Center
Glendale Adventist Medical Center – Wilson Terrace	Kaiser Foundation Hosp – Oakland Campus
Glendale Memorial Hospital and Health Center	Kaiser Foundation Hosp – Panorama City
Good Samaritan Hospital – Los Angeles	Kaiser Foundation Hosp – Riverside
Henry Mayo Newhall Memorial Hospital	Kaiser Foundation Hosp – Sacramento
John Muir Medical Center	Kaiser Foundation Hosp – Santa Clara
Los Robles Regional Medical Center	Kaiser Foundation Hosp – South Sacramento
Mark Twain St. Joseph’s Hospital	Kaiser Foundation Hosp – Valley Medical Center
Marshall Medical Center (1-RH)	Kaiser Foundation Hosp – Walnut Creek
Monterey Park Hospital	Kern Medical Center
Mt. Diablo Medical Center	Loma Linda University Medical Center
O’Connor Hospital – San Jose	Madera Community Hospital
Oroville Hospital	Memorial Hospital Medical Center – Modesto
Paradise Valley Hospital	Mercy Hospital – Bakersfield
Providence Holy Cross Medical Center	Mercy Hospital – Folsom
Queen of Angels Hollywood Presbyterian Med Center	Orange Coast Memorial Medical Center
San Clemente Hospital and Medical Center	Pacifica Hospital of the Valley
San Ramon Regional Medical Center	Palomar Medical Center
Santa Monica – UCLA Medical Center	Parkview Community Hospital Medical Center
Scripps Memorial Hospital – Chula Vista	Pioneers Memorial Hospital
Scripps Memorial Hospital – Encinitas	Placentia Linda Hospital
Scripps Memorial Hospital – La Jolla	Pomerado Hospital
Sharp Chula Vista Medical Center	Redlands Community Hospital
Simi Valley Hospital and Health Care Services-Sycamore	Riverside County Regional Medical Center
Sonora Regional Medical Center	San Gorgonio Memorial Hospital

Hospitals with "Better than Expected" (Lower) Death Rates, Continued	Hospitals with "Worse than Expected" (Higher) Death Rates, Continued
St. Helena Hospital	San Joaquin General Hospital
St. John's Hospital and Health Center – Santa Monica	Sierra View District Hospital
St. John's Regional Medical Center – Oxnard	St. Bernardino Medical Center
St. Louise Regional Hospital	St. Joseph Hospital – Eureka
St. Rose Hospital	St. Joseph Hospital – Orange
St. Vincent Medical Center	Stanford Hospital – Palo Alto
Tri-City Regional Medical Center	Torrance Memorial Medical Center
University of California – Irvine Medical Center	Tri-City Medical Center
University of California – San Diego Medical Center	University Medical Center – Fresno
Washington Hospital – Fremont	Victor Valley Community Hospital
West Hills Hospital and Medical Center	Woodland Memorial Hospital
White Memorial Medical Center	

Note: Of the 48 hospitals rated as top performers in this report, 20 (42%) were also top performers in the prior report. Of the 47 hospitals that performed poorly in this report, 23 (49%) were poor performers in the prior CAP report. Since this report includes two years of data from the prior report (2002-2004) we would expect some overlap in hospital performance across reports. There were no hospitals that changed from "better" in the prior report to "worse" in this report or vice versa.

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Introduction

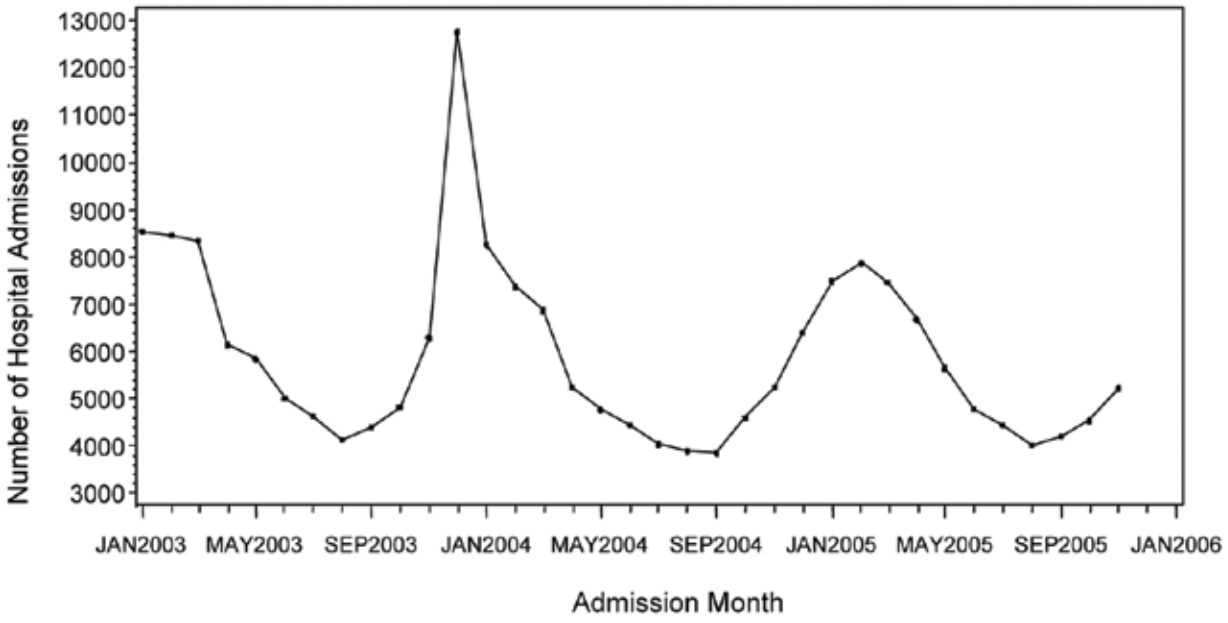
Pneumonia is an acute infection of the lung tissue. Cases may result from bacteria (most commonly Streptococcus or Staphylococcus), viruses, fungi, dust particles, or other objects small enough to be inhaled.

Pneumonia is the sixth most frequent cause of death in the United States. Among diseases caused by infection it is the number one cause of death.[1,2,3] It is estimated that there are 2-4 million pneumonia cases annually in the United States.

Risk of pneumonia is greatest for people who have weakened immune systems (for example, due to use of immunosuppression medications or infection with HIV), loss of the ability to clear contaminants in the lungs (due to smoking tobacco or advanced age), or exposure to dust or other particulates at work or at home. Risk is also increased for people who have respiratory infections, such as influenza. For pneumonia patients who are admitted to the hospital, timely diagnosis and treatment are critical to improving chances of survival.

Community-acquired pneumonia (CAP) is pneumonia that is acquired outside an institutional setting, for example, at home or at work. In contrast, hospital-acquired pneumonia is acquired by patients while they are hospitalized for surgery and other treatments. This report does not assess quality of care for treatment of hospital-acquired pneumonia. As shown in Figure 1, hospitalizations for community-acquired pneumonia in California vary by season, with admissions highest in winter months.

Figure 1: Community-Acquired Pneumonia Admissions, January 2003 - November 2005



1 Bartlett JG, Dowell SF, Mandell LA, File TM, Musher DM, Fine MJ, Guidelines for the Management of Community-Acquired Pneumonia in Adults, Clinical Infectious Diseases, 2000; 31:347-82.
2 Marrie TJ, Community-acquired pneumonia: epidemiology, etiology, treatment, Infectious Disease Clinics of North America, 1998 Sep, 12(3):723-40.
3 Garibaldi RA, Epidemiology of community-acquired respiratory tract infections in adults: incidence, etiology and impact, The American Journal of Medicine, 1985; 78:32s-37s.

Changes to 2003-2005 CAP Report

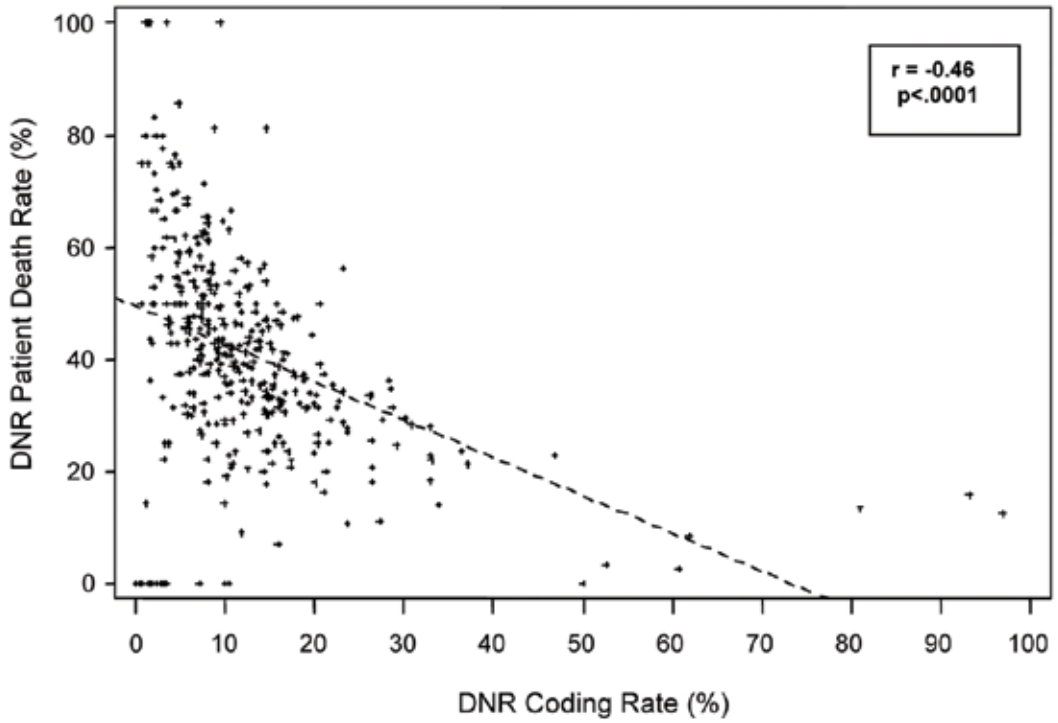
In the two previous CAP reports (1999-2001 and 2002-2004), one of the risk factors used in the risk-adjustment model was presence of a "Do Not Resuscitate" (DNR) order in the patient's medical record. Presence of a DNR order was considered a risk factor for mortality based on the overall evidence that DNR orders are completed for sicker patients.

In previous reports a hospital was rated as "better than expected" only if its risk-adjusted death rate was significantly better (lower than the state average) in risk-adjustment models that included and excluded DNR. Similarly, a hospital was rated as "worse than expected" only if its risk-adjusted death rate was significantly worse (higher than the state average) in both risk-adjustment models.

In the current report, DNR is not used as a risk factor in the model. Hospitals are rated as significantly "better than expected" or "worse than expected" based on the results of a single model that does not include the DNR variable. This change was made because a recent study completed by OSHPD staff demonstrated that the use of DNR orders varies widely across hospitals.

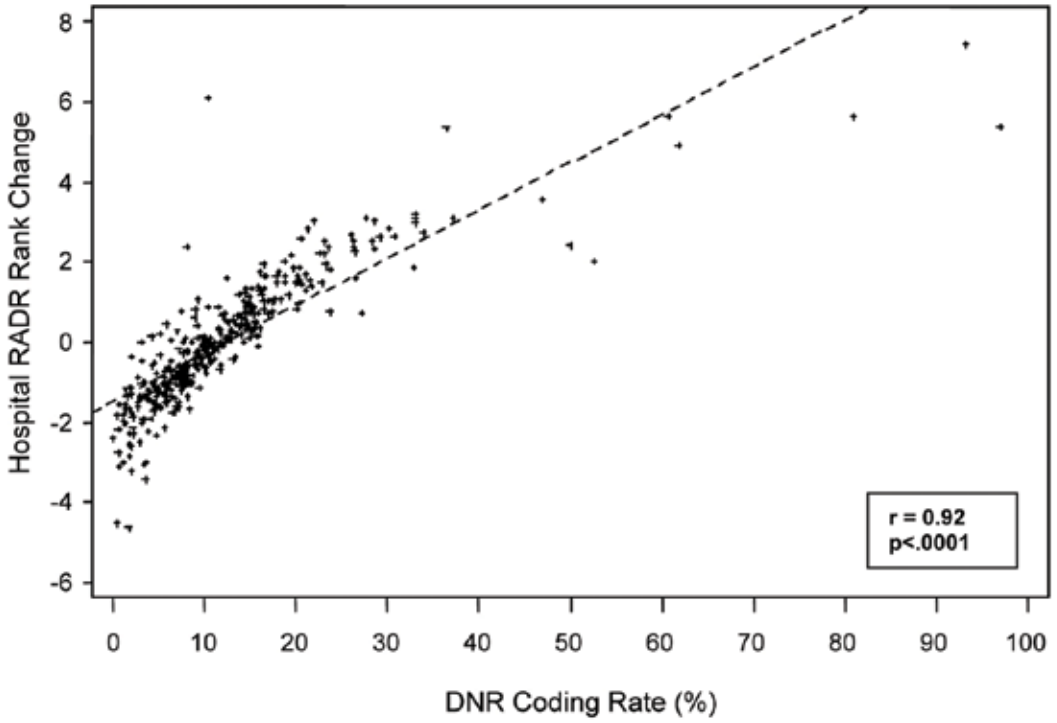
The study found a negative correlation of $r = -0.46$ ($p < .0001$) between hospital DNR coding rates (percent of patients with a DNR order) and hospital DNR death rates (percent of DNR patients that died), Figure 2. That is, hospitals that wrote DNR orders for a large percent of their patients had a lower death rate for those DNR patients. This finding may result from hospital administrative policies at some facilities that encourage the recording of advance directives for most patients. Consequently, the risk-adjustment model that included DNR gave hospitals with high DNR coding rates more credit than appropriate.

Figure 2: Correlation Between DNR Coding Rate and DNR Patient Death Rate: Community-Acquired Pneumonia Patients, 2002-2004



The study also found a positive correlation of r = 0.92 ($p < 0.0001$) between the hospital DNR coding rate and the change in hospital risk-adjusted mortality rate ranking when DNR was included as a risk factor in the model (Figure 3). This significant positive correlation indicates that the hospitals that gave DNR orders to a higher percentage of their patients received more improvement in their risk-adjusted mortality ranking than did other hospitals.

Figure 3: Correlation Between DNR Coding Rate and Hospital RADR Rank Change: Community-Acquired Pneumonia Patients, 2002-2004



While the study was based on the data from the 2002-2004 CAP cohort, similar results were found using data for patients admitted with congestive heart failure (CHF) during 2003-2005. Together these studies indicate that hospitals with higher DNR rates tend to give these orders to less ill patients. As a result, some hospitals receive higher quality ratings because they get credit for treating sick patients that are not likely to be as ill as the model predicts.

Based on these research findings, the Technical Advisory Committee (on August 03, 2007) established by Assembly Bill 524 recommended to OSHPD that DNR not be used in risk-adjustment models for outcome reports. Thus, this report is based on a risk-adjustment model that does not use DNR as a risk factor. However, recognizing the importance of taking into account the fact that some patients are admitted for palliative care only, OSHPD is currently working with its constituents to create a new indicator for “comfort care” that will replace “DNR.”

Evaluating Hospital Quality

This report measures the quality of care received by CAP patients in California-licensed hospitals. It has two goals. One is to assist healthcare consumers and purchasers with assessment of the relative value of healthcare delivered to patients with community-acquired pneumonia. The second goal is to support and promote quality improvement by hospitals.

Quality of care was measured by patient outcome, that is, whether the patient died within 30 days of hospital admission. Other quality measures, such as hospital compliance with medical practice

recommendations, and other patient outcomes, such as quality of life, were not used because information about these factors is not available in the administrative discharge datasets.

A total of 208,837 adult patients were admitted to acute care hospitals during 2003-2005 for treatment of community-acquired pneumonia. About one out of eight patients (12.16%) died within 30 days of admission. The 30-day death rate includes deaths that occurred during an episode of hospitalization, as well as deaths occurring up to 30 days after the initial admission (Table 1). This measure is used instead of in-hospital mortality because hospitals vary in the amount of time they keep patients hospitalized before discharging them. Hospitals that discharge patients with a shorter length of stay might under-count the number of deaths in their CAP patients.

Table 1: Statewide Number of CAP Admissions and Deaths, by Admission Year

Year of Admission	Number of CAP Patients Hospitalized	Number of Deaths within 30-days of Admission	30-Day Death Rate (Percentage)
2003[1]	78,592	9,430	12.00
2004[2]	66,152	8,151	12.32
2005[3]	64,093	7,808	12.18
Total	**208,837**	**25,389**	**12.16**

For comparing hospital death rates with each other, as well as with the statewide rate, the raw death rate is not used. This is because it fails to reflect differences in the severity of patient illness across hospitals. A hospital receiving sicker patients is very likely to have a higher death rate, even if the medical care given was appropriate. To provide a fair comparison, statistical modeling adjusts for patient risk factors.

The effect of risk-adjustment on a hospital's death rate depends on the severity of illness in its patients. If the patients are sicker than the statewide rate then risk-adjustment will shift the hospital's death rate downward to a lower (better) rate. On the other hand, if a hospital's patients are comparatively less sick at the time they are admitted, the adjustment will shift the death rate upward, "penalizing" them for treating a patient group that is not so severely ill.[4]

Hospitals were rated as "better than expected" if their risk-adjusted death rates were significantly lower than the statewide rate. They were rated as "worse than expected" if their rates were significantly higher and rated "as expected" if the risk-adjusted death rate was not significantly different from the statewide rate of 12.16%.

1 For the year of 2003 patients admitted between December 2, 2002 and December 31, 2003 were included to calculate 30-day death for January 2003.
2 For the year of 2004 patients admitted between January 1, 2004 and December 31, 2004 were included.
3 For the year of 2005 patients admitted between December 2, 2005 and December 31, 2005 were excluded because death certificates were not available at the time of analysis to determine 30-day mortality for these late admissions.
4 Risk-adjusted death rates are comparable within the cohort of the study, but cannot be compared with rates from other studies. These can be compared with the rate of the previous CAP reports, by pooling all data together and recalculating rates using the same set of coefficients.

To be conservative a 98% significance test was used to rate the hospitals. This means one can be 98% confident that a rating of “better than expected” or “worse than expected” was not arrived by chance. Smaller hospitals have less statistical power to be classified as significantly different from the statewide rate. Thus, their risk-adjusted death rates would have to be much higher or lower than the statewide rate for them to be “significantly” different. Conversely, a large hospital is more likely to be found significantly different, even with death rates that are only moderately higher or lower. For a detailed technical discussion of how statistical significance tests were performed, see Appendix A.

As shown in Table 2, three quarters (73%) of the hospitals had risk-adjusted death rates that were within the expected range for CAP patients. The analysis also identified 48 hospitals with rates that were “better than expected” (lower) and 47 with risk-adjusted death rates that were “worse than expected” (higher).

Table 2: Summary of Hospital Ratings

Hospital Performance Category	Number of Hospitals	Percent of Hospitals
As Expected	259	73.2
Better than Expected	48	13.6
Worse than Expected	47	13.3
Total	**354**	**100.0**

Note: This table excludes the 30 hospitals that were not rated because of small sample size (see Table 3).

Among the 47 hospitals rated “worse than expected” the average risk-adjusted death rate was 16.7% (range: 14.0 – 21.9%). This is twice as high as the average for the 48 “better than expected” hospitals, which was 8.2% (range: 5.4 – 10.3%).

How The Healthcare Quality Outcome was Measured

Healthcare quality was measured in this report by calculating risk-adjusted death rates. These rates are useful for comparing quality of care because:

- **They have been risk-adjusted.** Risk-adjustment allows readers to meaningfully compare a specific hospital’s results to both the statewide benchmark and to the results of other hospitals. The factors that are used in the risk-adjustment models are: patient age, gender, number of prior admissions, and co-morbidities at the time of hospital admission.
- **They have been validated.** Before developing the model, OSHPD conducted a validation study to determine whether the data items related to CAP were being reported correctly in the administrative patient discharge data records. The study found that variations in hospital reporting did not significantly affect the risk-adjusted death rates. Also, the results were validated by differences in clinical practice; low mortality hospitals were found to treat community-acquired pneumonia more aggressively than high mortality hospitals.[1]

Risk factors such as being male and having lung cancer, which are associated with a higher probability of death, were selected under guidance from a clinical panel of pneumonia experts. Selection of risk factors was based on their importance in the medical literature and on the strength of their statistical association with death in analyses of patient discharge data linked with state vital statistics records.

1 Hass J, Luft H. Report for the California Hospital Outcomes Project Community-Acquired Pneumonia, 1996: Model Development and Validation. Office of Statewide Health Planning and Development, Sacramento, Nov. 2000. Available at: http://www.oshpd.ca.gov.

Adjustment was only made for co-morbidities that were present at the time of admission. Complications, which are diagnoses that occur after admission, were not used to "credit" hospitals for the illness level of their patients. The California Patient Discharge Data includes an indicator that shows whether each diagnosis was a co-morbidity (i.e., a condition present at admission) or not. Thus, of the many diagnoses that can occur as either complications or as co-morbidities, it was possible to correctly identify those which were truly present at the time of the patient's admission.

Risk Factors for CAP Mortality Outcome

The risk factors included in the risk-adjustment model, with their associated weights, odds ratios (ORs), and confidence intervals are listed in Table A.6 of Appendix A.

The strongest predictor of death was a diagnosis of respiratory failure at the time of admission. It increased the risk of death by five times (OR = 5.05). Other diagnoses that were strong predictors of death for these patients were lung cancer (OR = 3.36), septicemia (OR = 3.09), other solid cancers (OR = 2.60), and coagulopathy (OR = 1.91).

Calculation of Risk-Adjusted Death Rates (RADRs)

The outcome measure is based on deaths in CAP patients within 30 days of their initial (index) admission to the hospital to be treated for CAP. The risk-adjusted mortality outcome is calculated in four steps (explained in greater detail in Appendix A):

- First, the observed number of 30-day deaths is divided by the total number of CAP cases in the hospital to obtain the observed death rate (O).
- Second, each patient's probability of death is calculated using the risk-adjustment model. These probabilities are combined to obtain the expected number of deaths for the hospital. The expected number of deaths is divided by the actual number of cases to obtain the expected death rate (E).
- Third, the observed rate is divided by the expected rate (O/E). This ratio is then multiplied by the statewide CAP death rate to obtain the hospital's risk-adjusted death rate.
- Fourth, a statistical test is applied to determine whether the hospital's risk-adjusted mortality outcome is significantly different from the state average.

If a hospital's observed rate is greater than the expected rate, the hospital had more deaths than expected, given the severity of illness in its patients. In this case the ratio of observed to expected would be greater than 1.0. Multiplying this number by the statewide rate results in a number greater than the statewide rate. That is, the risk-adjusted death rate is higher than the statewide rate.

On the other hand, if a hospital's observed death rate is lower than the expected rate then the ratio is less than 1.0. Multiplying this number by the statewide rate results in a number lower than the statewide rate. For this hospital, the risk-adjusted death rate is lower than the statewide rate.

Whether the hospital's outcome is statistically significant or not depends on three factors: the number of CAP patients at the hospital, the size of the gap between the hospital's risk-adjusted death rate and the statewide benchmark, and the confidence level selected for the test. For this report, a conservative 2% level of confidence was used (indicated as $p<0.02$). With this level of confidence, there are just two chances in 100 of making an error whether a hospital's outcome is truly greater or smaller than the statewide benchmark.[1]

1 Luft HS, Brown BW Jr. Calculating the probability of rare events: Why settle for an approximation? Health Services Research 1993; 28:419-439.

For hospitals with large numbers of patients the statistical confidence interval will be narrow, so moderate or even small-sized differences from the statewide rate might be significantly different. For small hospitals, the confidence interval is wider. This means that a risk-adjusted death rate must have a larger difference from the statewide rate to be found significantly different.

Hospitals Excluded Because of Small Numbers of Patients

Some hospitals were excluded from the analysis because they treated no CAP patients or only a small number. Table 3 shows the number of patients and deaths at hospitals that admitted fewer than 30 CAP patients during the three-year period of this report. A total of 350 CAP patients were reported from these hospitals during the time period considered, with a total of 24 deaths. These small numbers resulted in extremely wide confidence intervals that could not be meaningfully interpreted. These hospitals were not rated as significantly higher or lower than the statewide 30-day death rate and are not shown in Chart 1.

Table 3: Hospitals with Fewer Than 30 CAP Admissions during 2003-2005: Number of Patients and Deaths within 30 Days

County	Hospital	Number of CAP Patients	Number of Deaths
Alameda	Children's Hospital and Research Center at Oakland	11	0
Fresno	Central Valley Orthopedic and Spine Institute	2	0
Fresno	Fresno Heart Hospital	11	1
Inyo	Southern Inyo Hospital	15	2
Kern	Mercy Westside Hospital	16	1
Lassen	Lassen Community Hospital	17	4
Los Angeles	Avalon Municipal Hospital	12	1
Los Angeles	Barlow Respiratory Hospital	6	0
Los Angeles	Children's Hospital of Los Angeles	23	1
Los Angeles	Doctors Hospital of West Covina, Inc.	24	3
Los Angeles	Earl and Lorraine Miller Children's Hospital	7	0
Los Angeles	Los Angeles County Rancho Los Amigos National Rehab Center	15	1
Los Angeles	Lincoln Hospital Medical Center	10	0
Los Angeles	Los Angeles County High Desert Hospital	11	0
Los Angeles	Monrovia Community Hospital	23	3
Los Angeles	Orthopaedic Hospital	5	0
Madera	Children's Hospital Central California	18	0
Modoc	Surprise Valley Community Hospital	15	1
Mono	Mammoth Hospital	21	0
Orange	Children's Hospital at Mission	1	0
Orange	Children's Hospital of Orange County	3	0
Orange	College Hospital Costa Mesa	7	0
Orange	Orange County Community Hospital – Buena Park	5	1
Orange	Santa Ana Hospital Medical Center	8	1
San Diego	Children's Hospital – San Diego	12	1

County, Continued	Hospital	Number of CAP Patients	Number of Deaths
San Diego	Sharp Mary Birch Hospital for Women	2	0
San Luis Obispo	San Luis Obispo General Hospital	14	0
San Mateo	Seton Medical Center – Coastside	2	1
Santa Barbara	St. Francis Medical Center-Santa Barbara	28	2
Santa Clara	Lucile Salter Packard Children's Hosp. at Stanford	6	0
Total		**350**	**24**

Hospital Risk-Adjusted Mortality Results

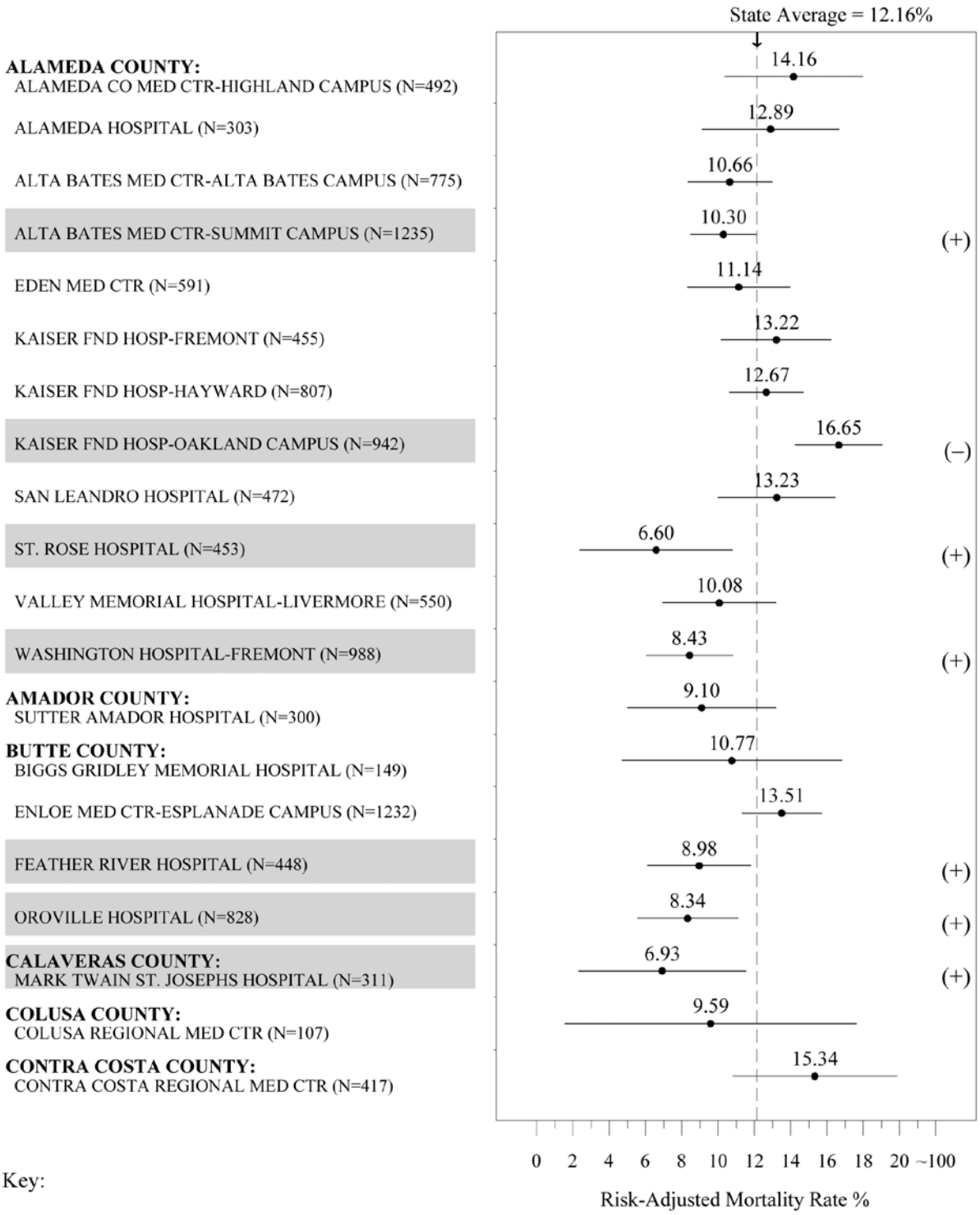
Chart 1 shows the risk-adjusted death rates and quality ratings for each hospital included in the analysis. The hospitals are listed in alphabetical order, by county. Lower risk-adjusted death rates are considered better.

The black solid circle (●) on a row's horizontal bar represents a hospital's risk-adjusted death rate and the horizontal bar itself represents its confidence interval. If this bar crosses the dashed vertical line placed at 12.16% (representing the statewide death rate) then the hospital's adjusted rate is considered "as expected." Otherwise, it is considered significantly different from the statewide rate.

Symbols on the chart indicate the following:

- Hospitals with significantly lower death rates have a "better than expected" quality rating for care of CAP patients and are identified with a plus sign (+).
- Hospitals with significantly higher death rates have a "worse than expected" quality rating for care of CAP patients and are identified with a minus sign (-).
- Hospitals that were not significantly different from the expected rate are not assigned a symbol and have an "as expected" quality rating for care of CAP patients.
- **Only hospitals that appear with shading are considered performance outliers ("better than expected" or "worse than expected") with respect to this report.**

Chart 1: Community-Acquired Pneumonia 30-Day Mortality Rates, 2003-2005



Key:

—●— Risk-adjusted mortality rate and confidence interval.
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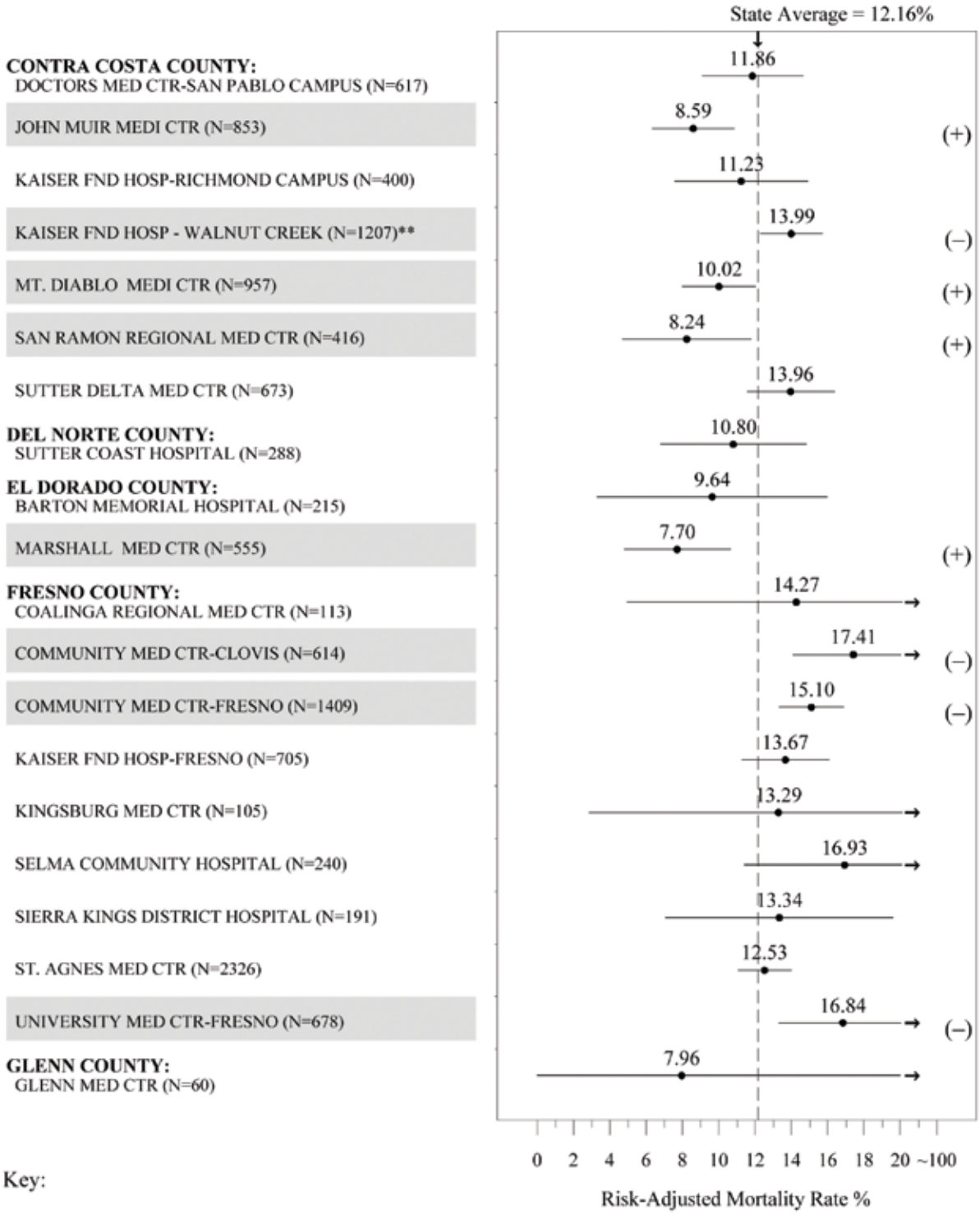

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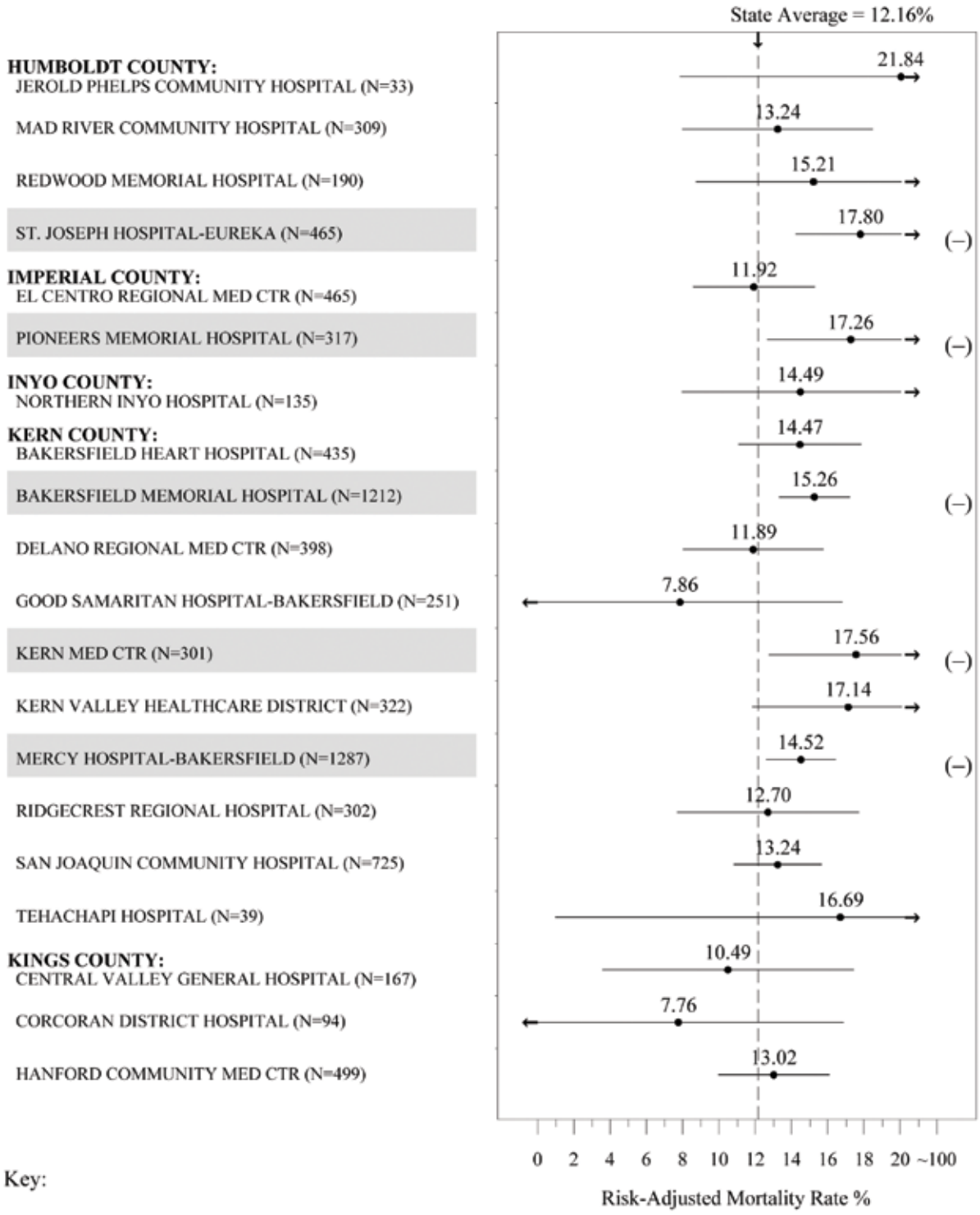

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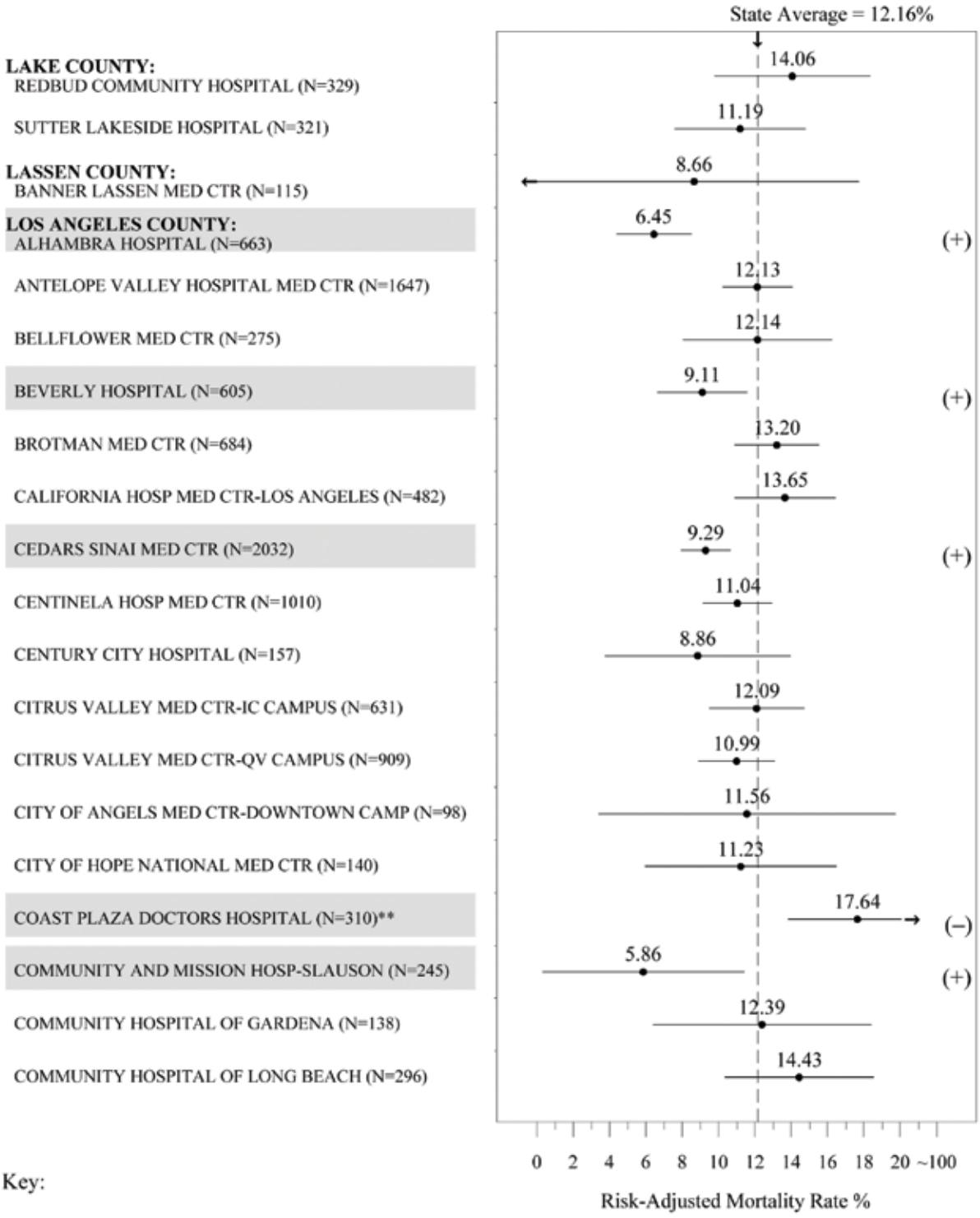

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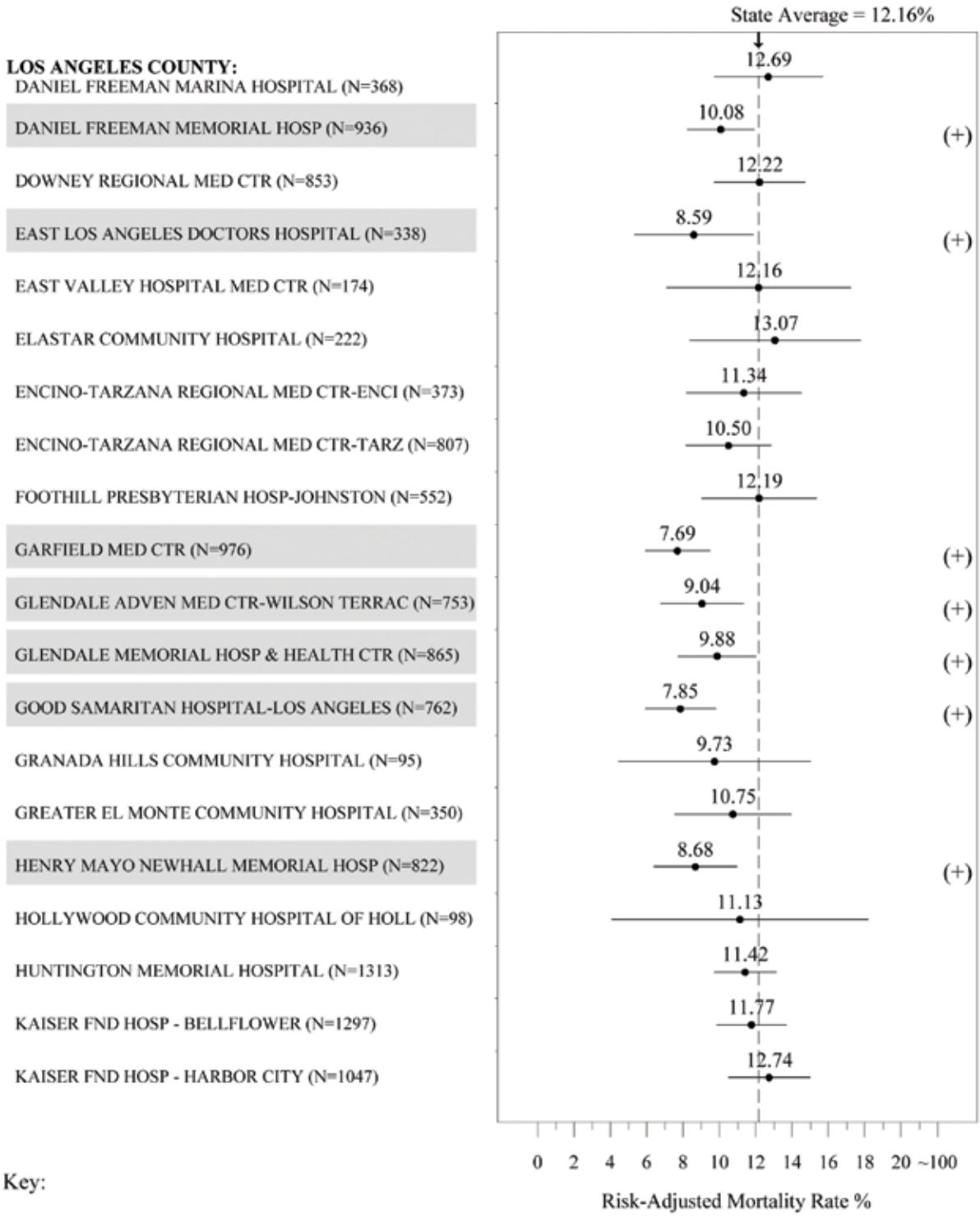

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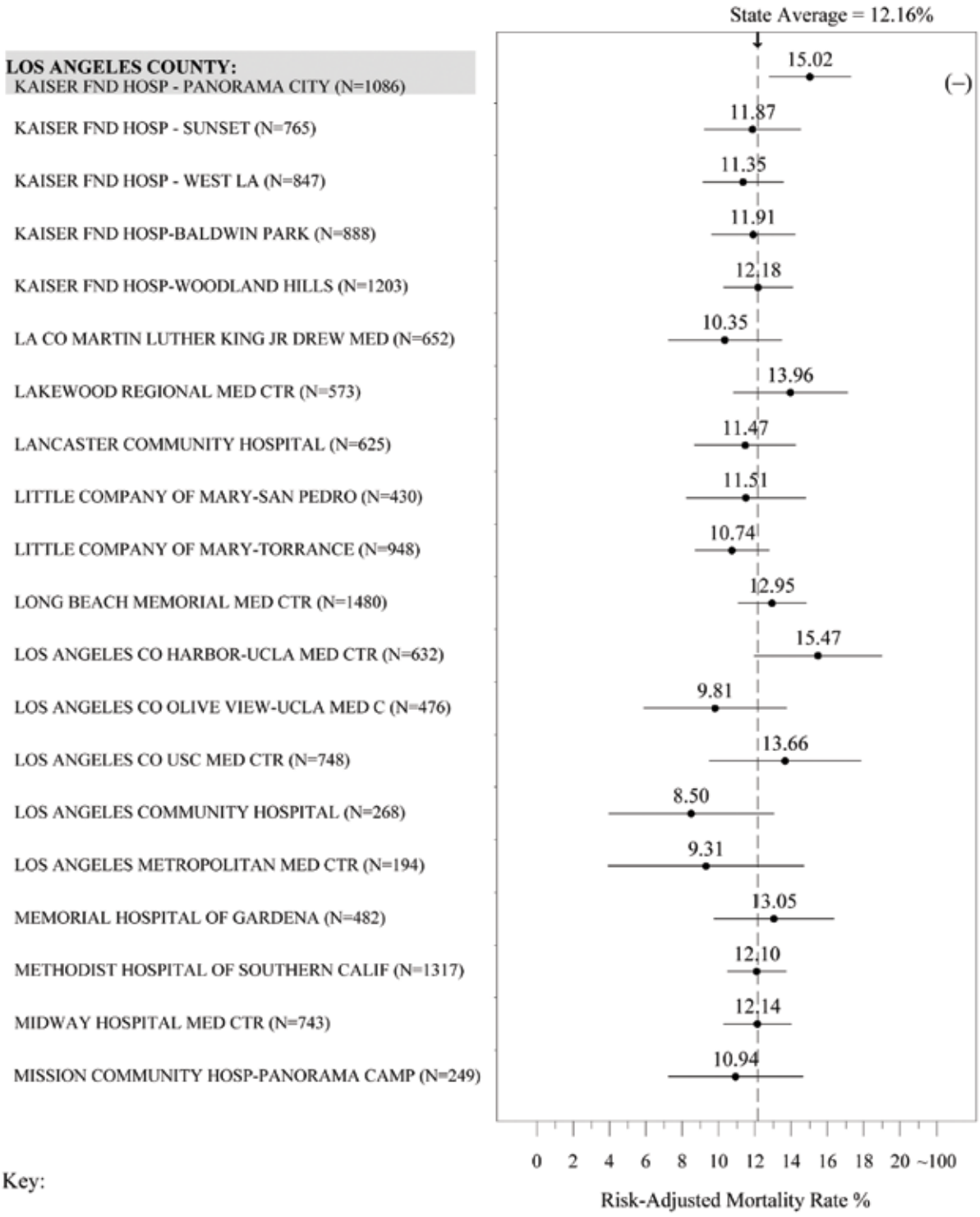

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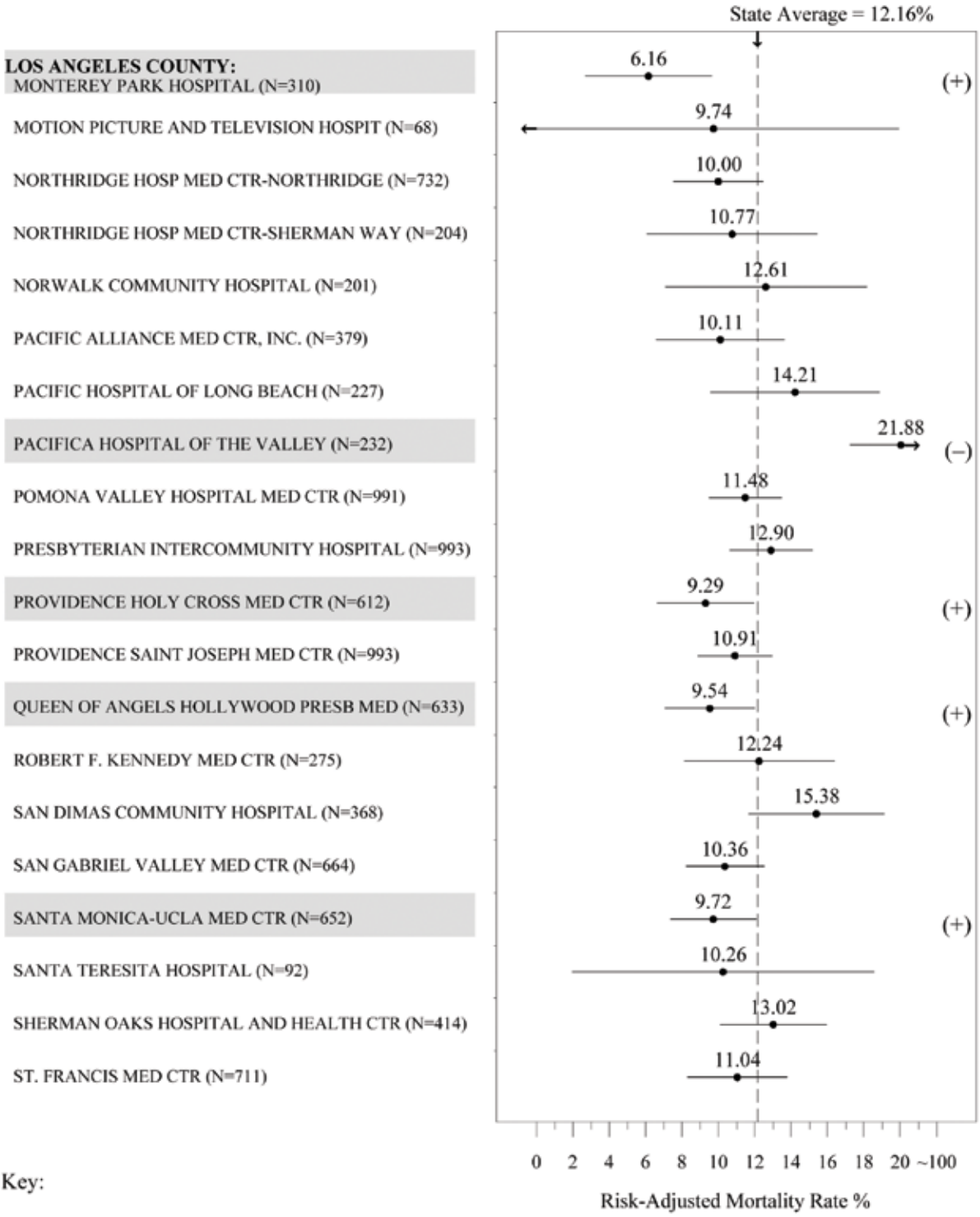

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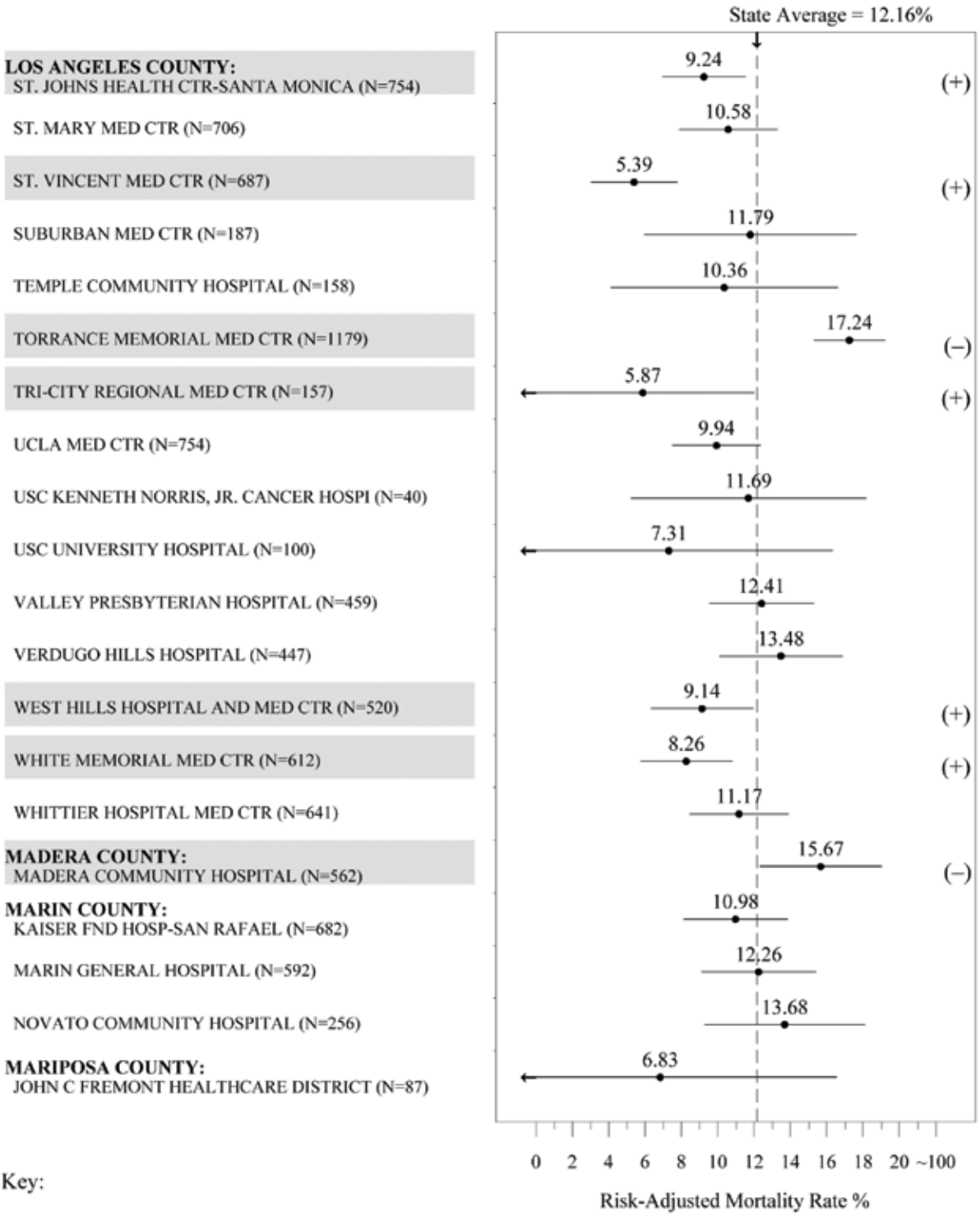

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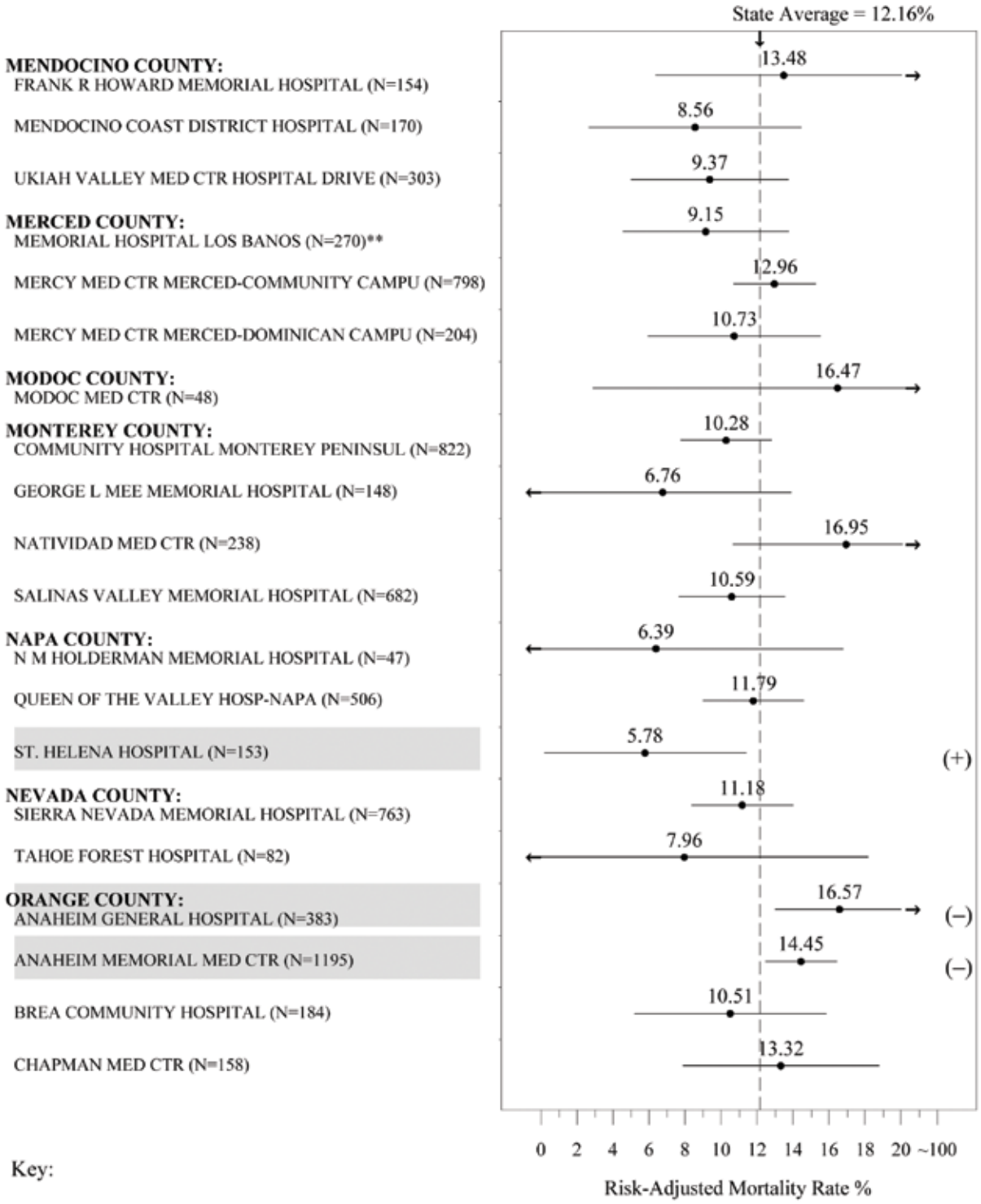

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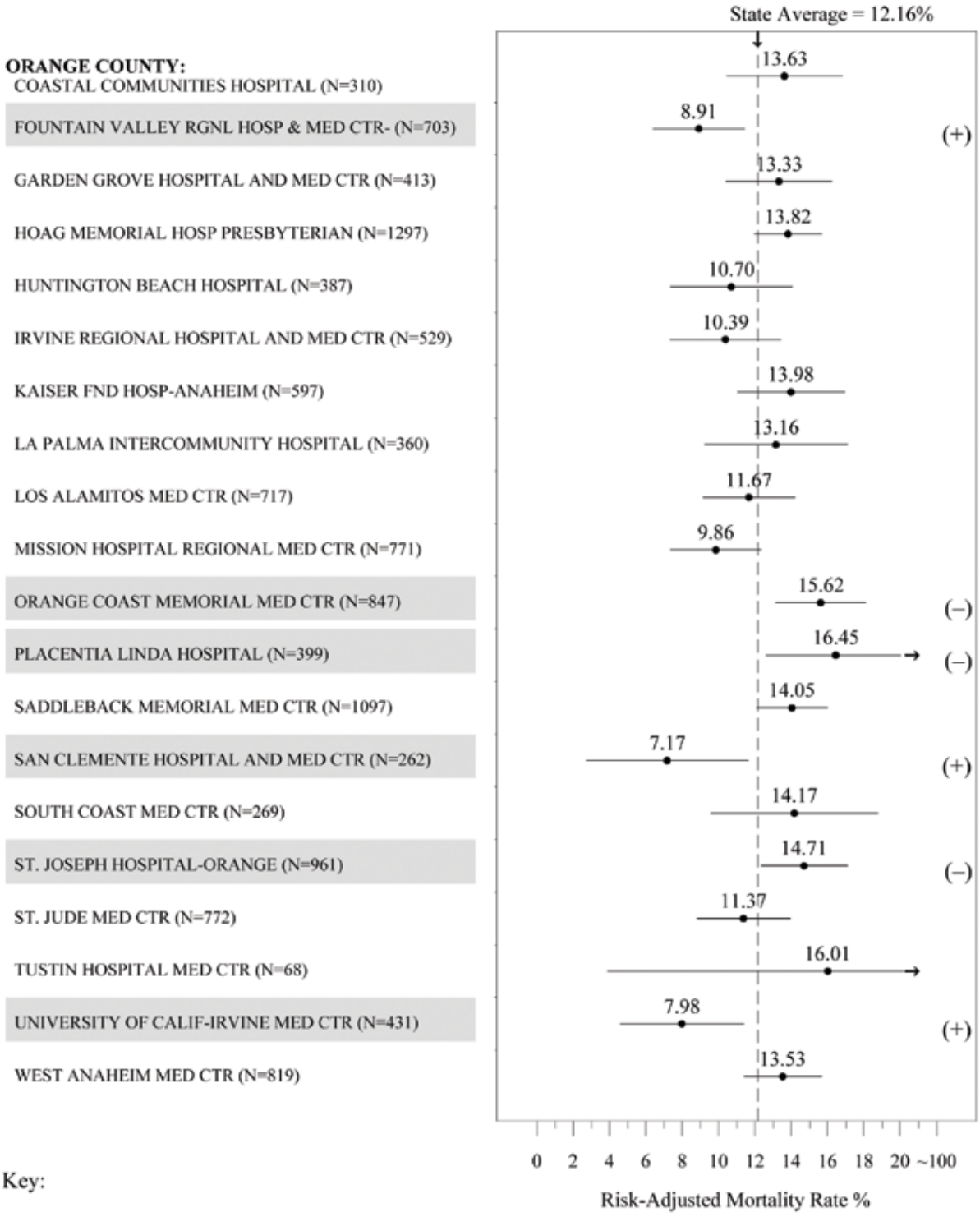

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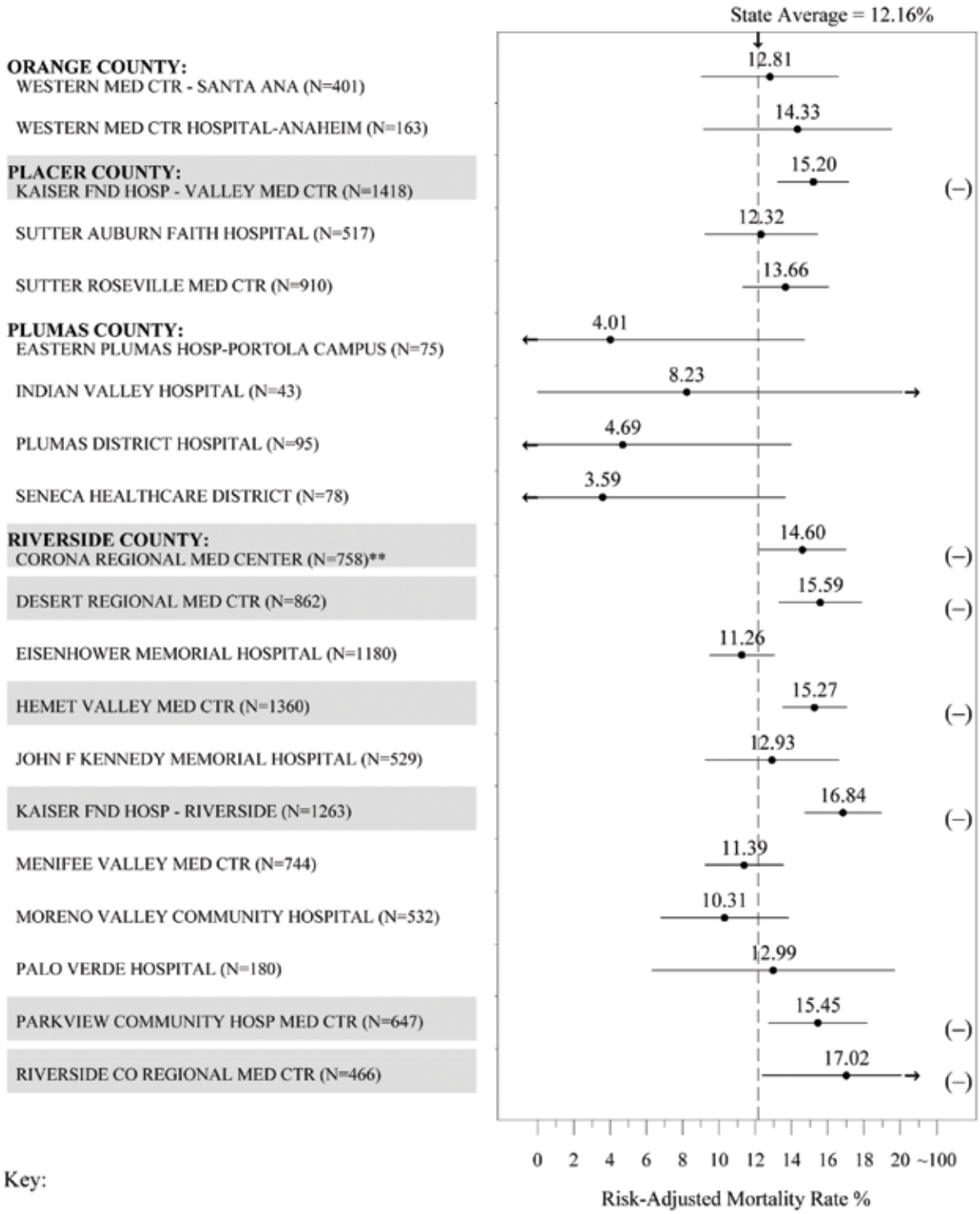

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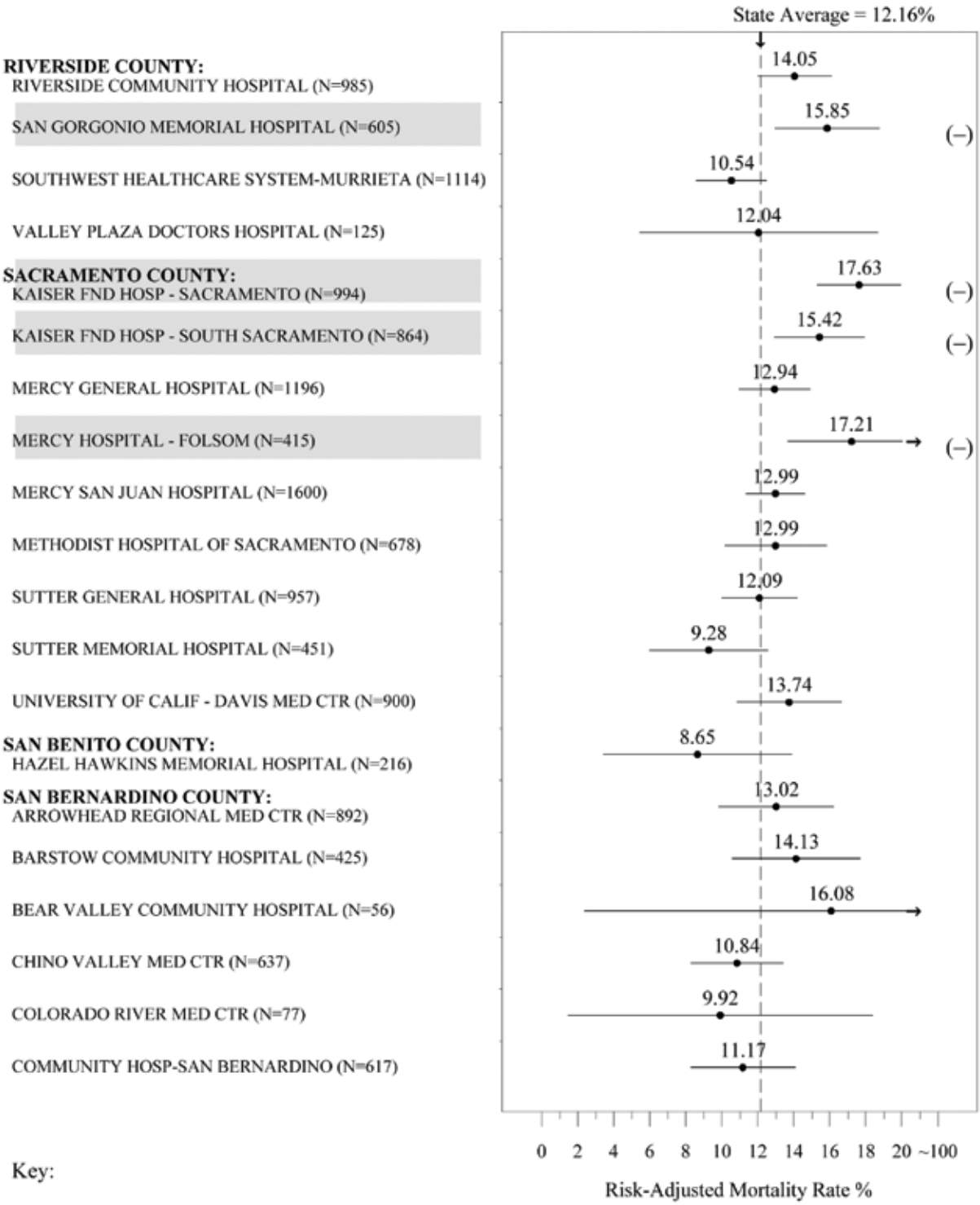

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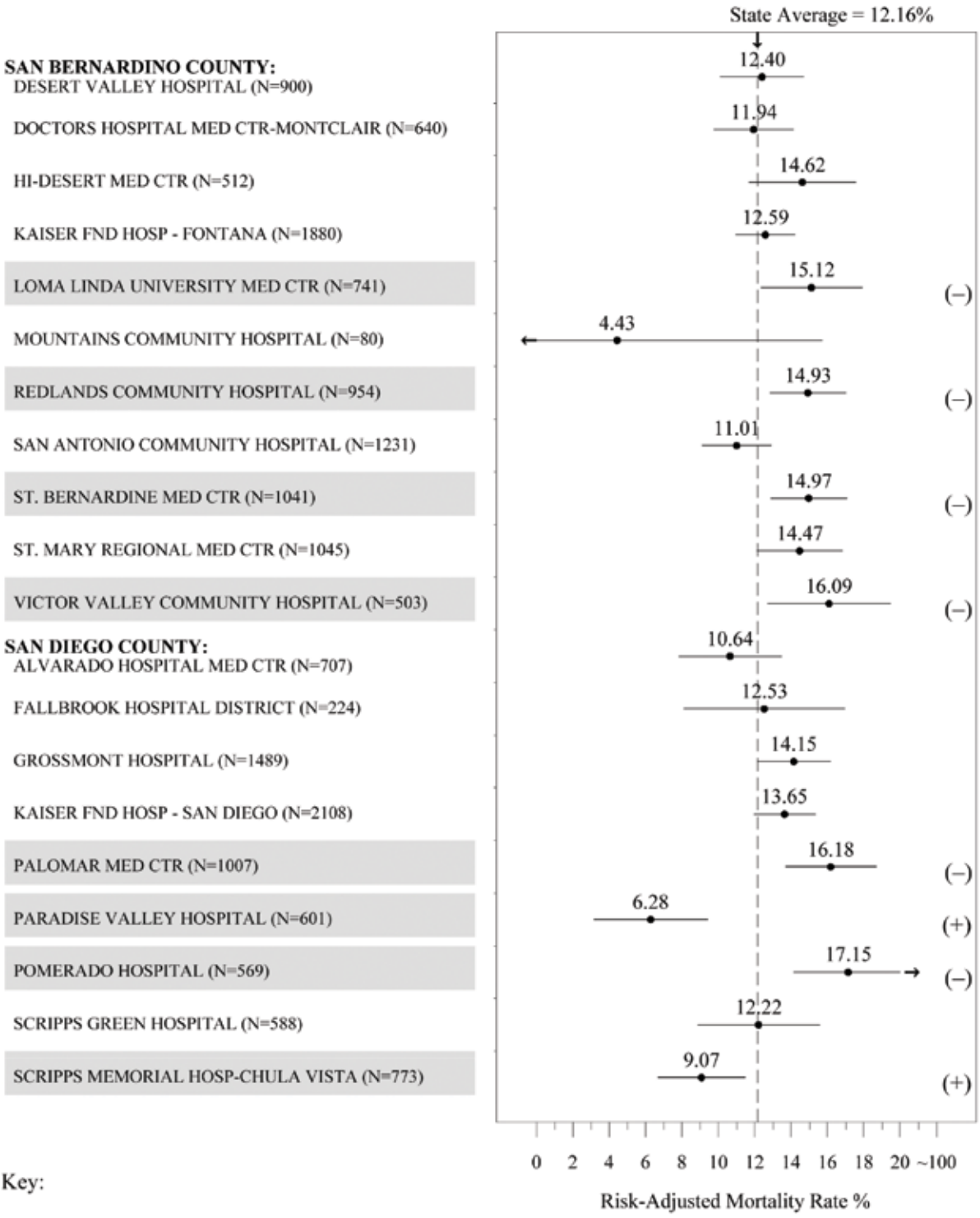

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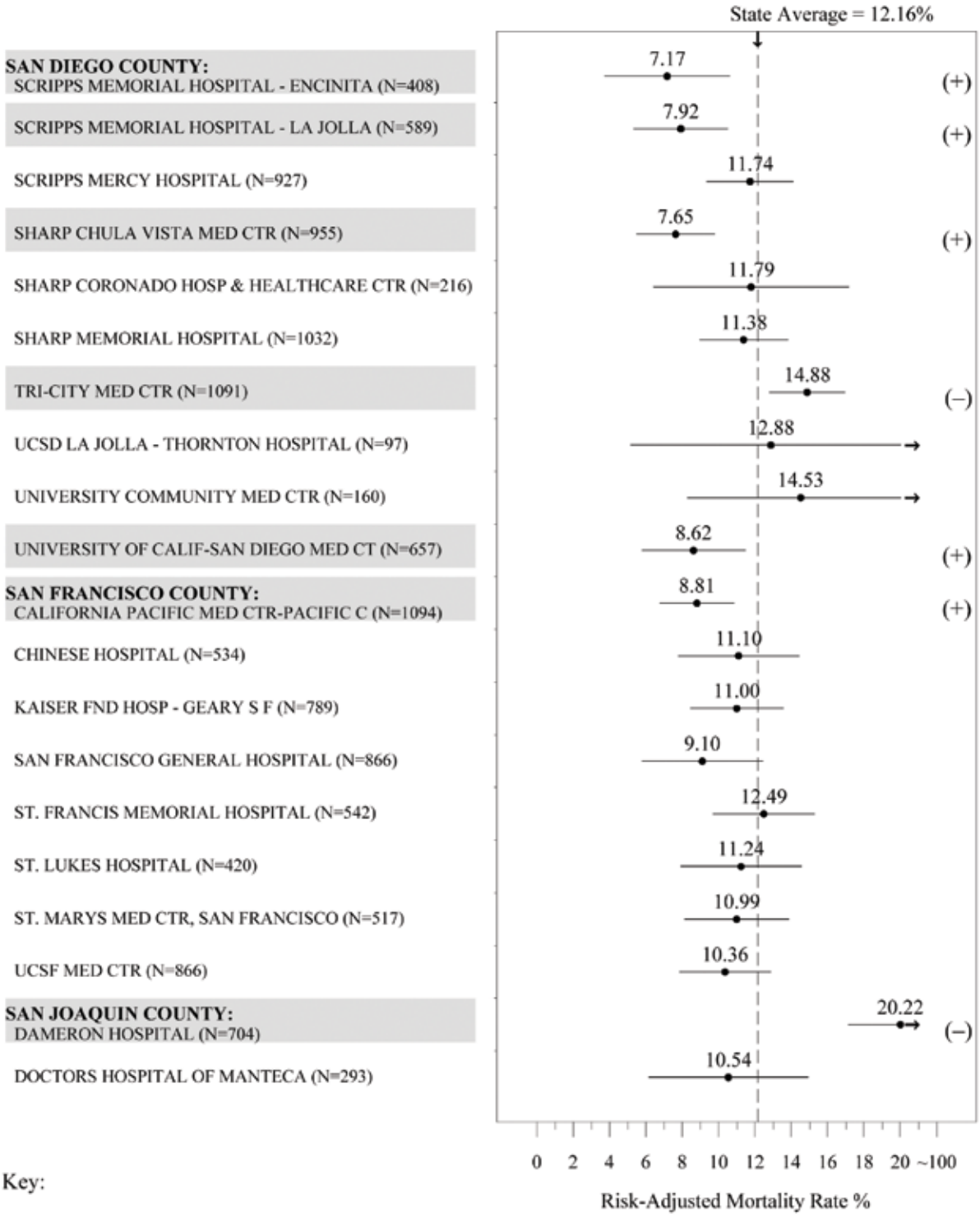

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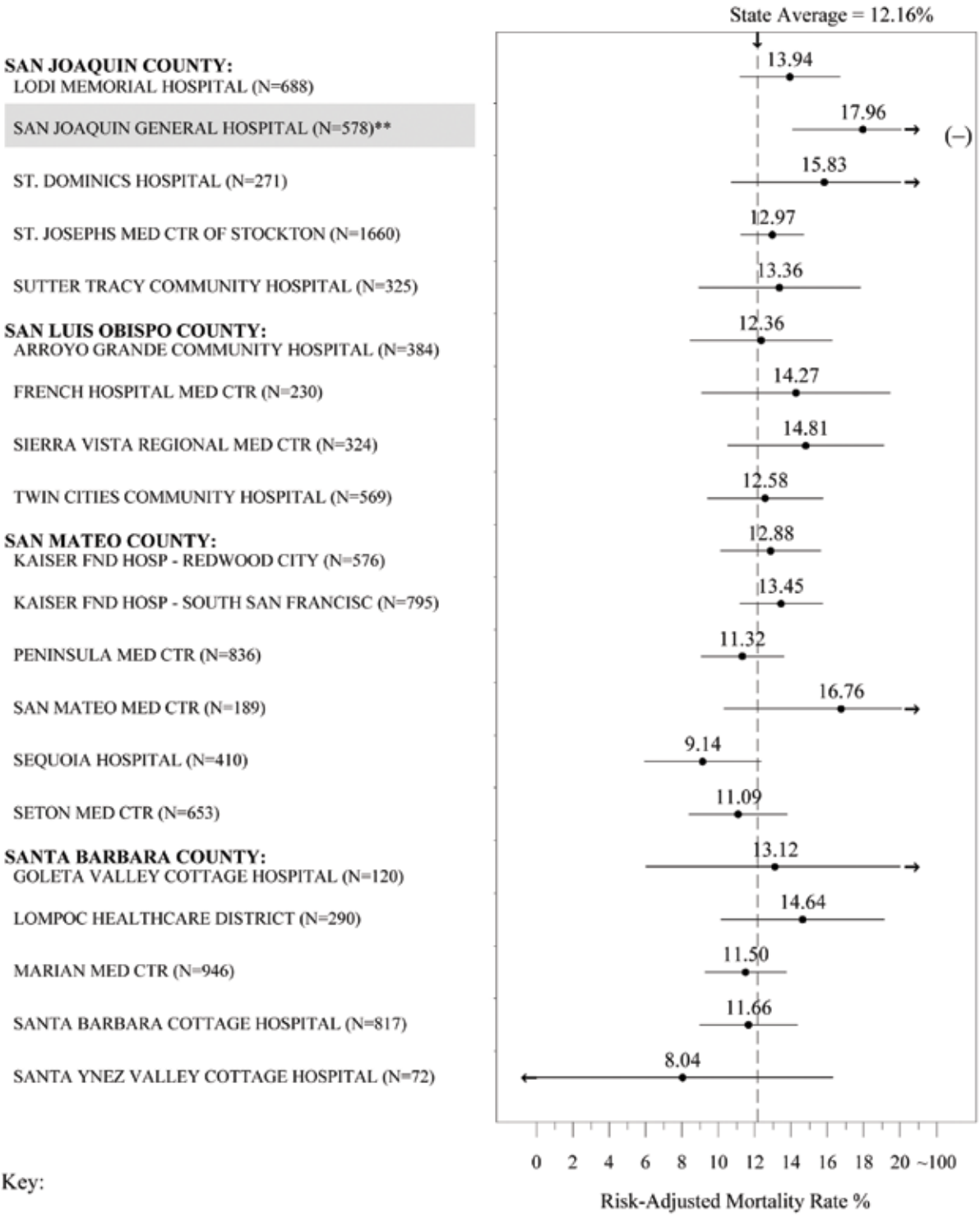

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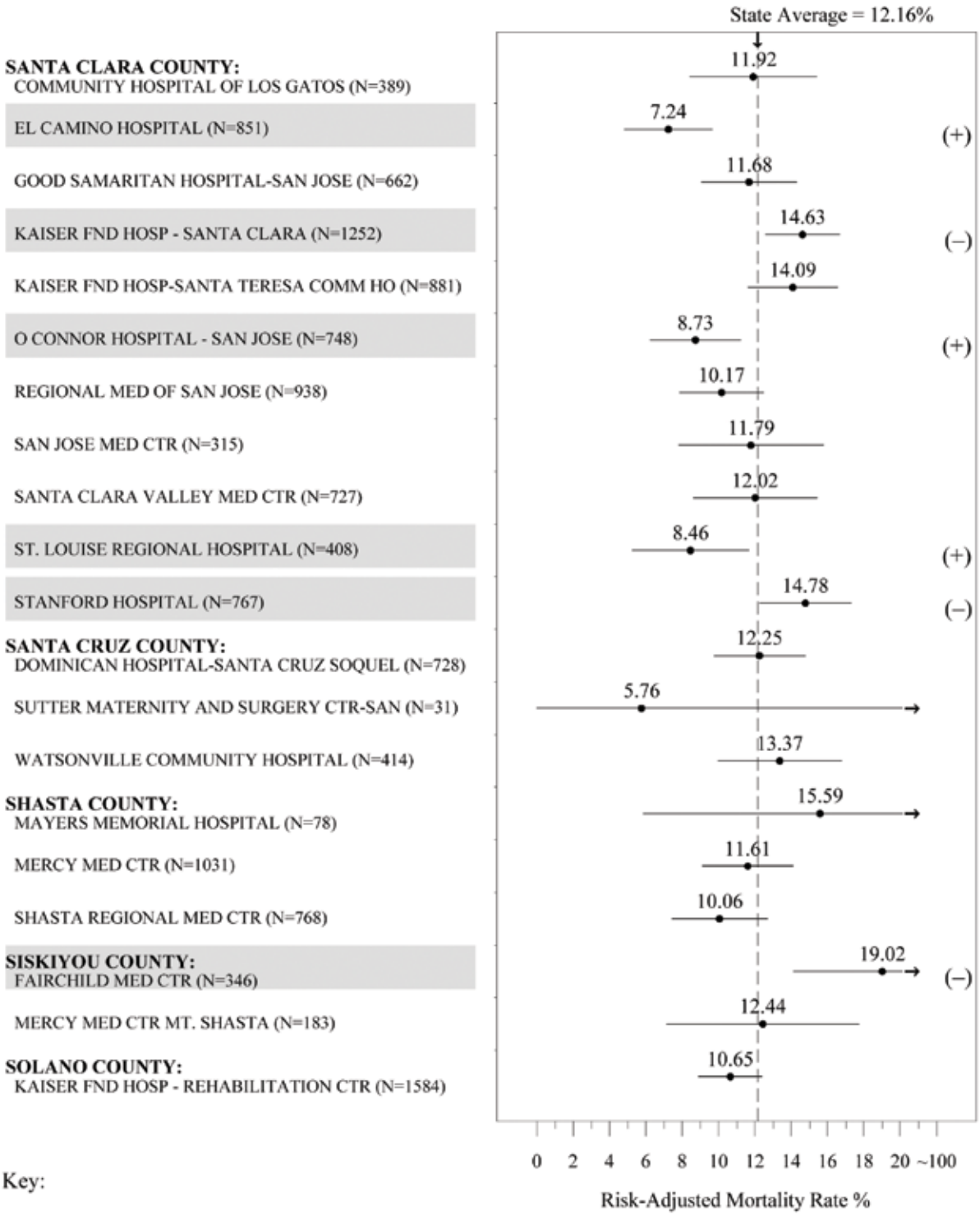

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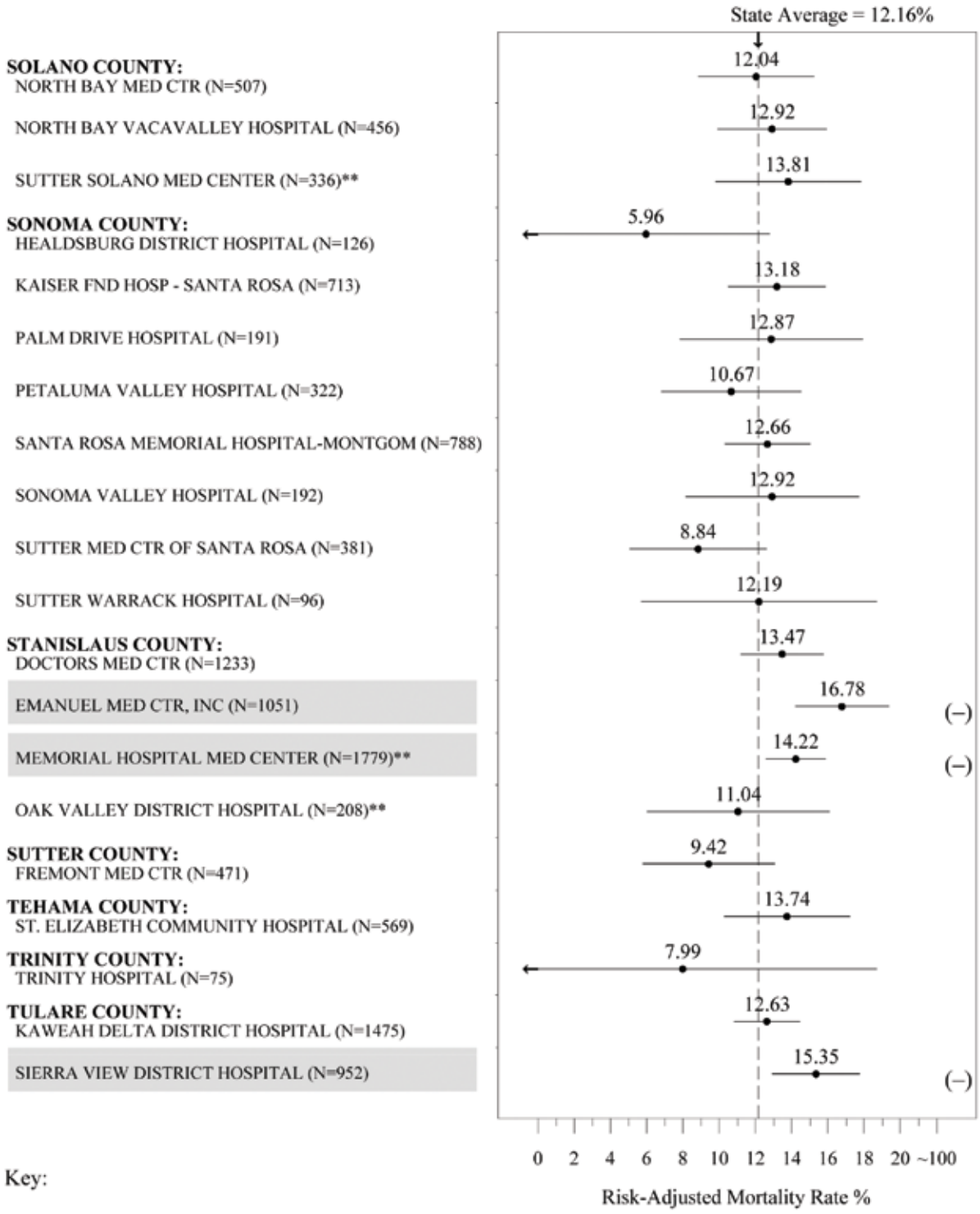

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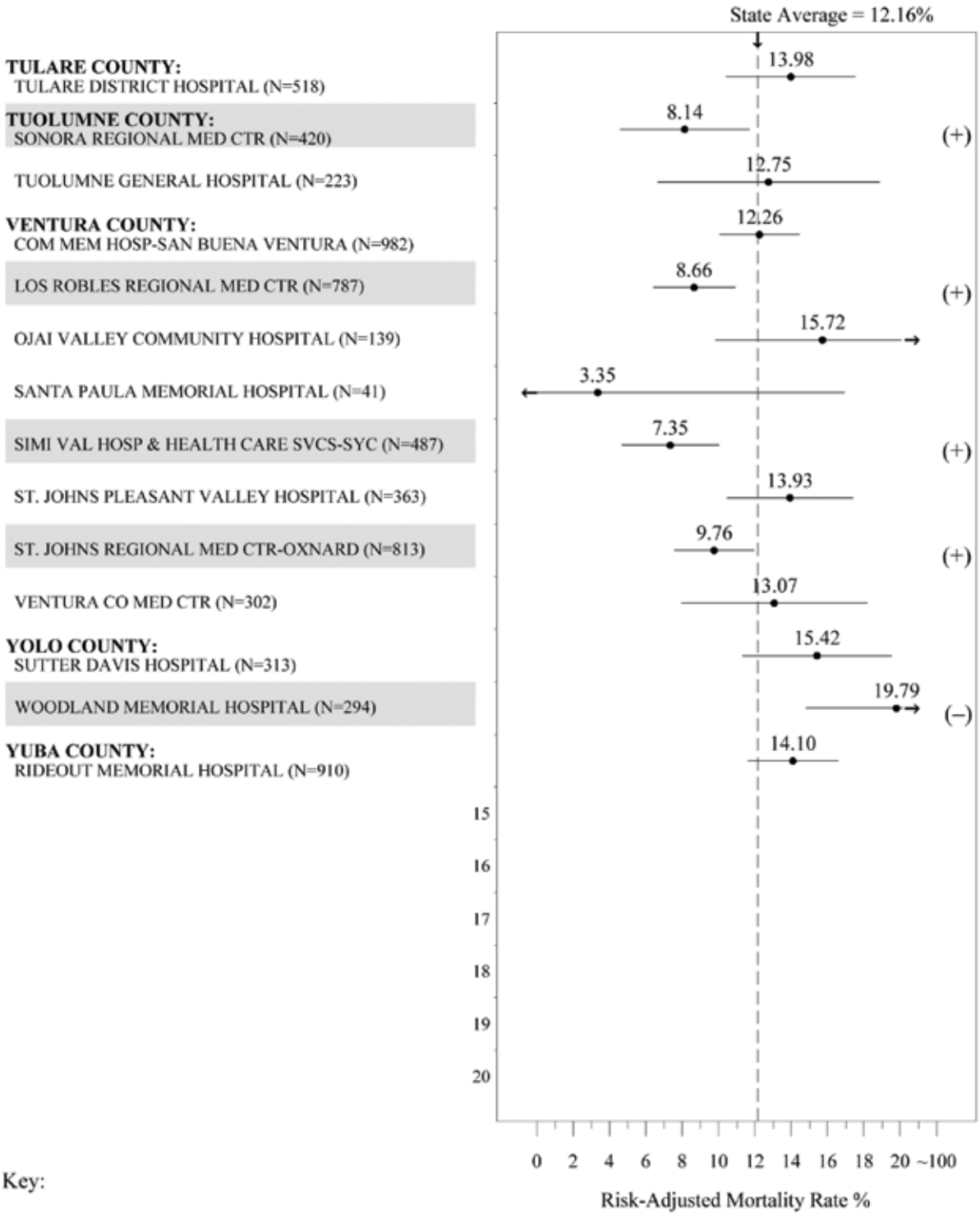

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Appendix A: Technical Notes

Development of the risk-adjustment model involved selection of an outcome measure, selection of risk factors, estimation and testing of the model, and calculation of the outcome measures for CAP admissions. The full report on the data validation and model development, "Report for the California Hospital Outcomes Program, Community-Acquired Pneumonia, 1996: Model Development and Validation," is available on the OSHPD Web page: http://www.oshpd.ca.gov. The original model was developed using data collected in 1996. For the current report, risk factor coefficients were recalculated using the patient discharge data collected in 2003-2005.

A detailed description of the methodology employed for this analysis is available in the prior reports, "Community-Acquired Pneumonia: Hospital Outcomes in California 2002-2004," which is available at http://www.oshpd.ca.gov. The Technical Appendix of that report fully explains the record linkage process, use of the "Condition Present at Admission" (CPAA) flag, model diagnostics, and steps for calculating expected death rates. However, in the following Technical Notes we summarize the key information about the data sources that were used, criteria for selection of hospitals and patients for analysis, the mortality measure and risk factors, quality of the model, and limitations of the methods.

Data Sources

The primary data source for this report was the Patient Discharge Data (PDD) collected by OSHPD. For this report, CAP patients were selected from 2003, 2004, and 2005 PDD files, with a subsequent match to admissions reported in the 2002 file. If there were several CAP hospitalizations for a given patient, only the first (initial) was analyzed. This one is considered the "index" record. To identify deaths that occurred after discharge, the PDD was matched to the California death certificate files (Death Statistical Master Files) for 2003, 2004, and 2005, using Social Security Number as the identifier common to both datasets.

Selection of Hospitals and Patients

All acute care hospitals reporting patient discharge information to OSHPD were eligible for inclusion.[1] In cases of hospital consolidation, name change, and change of address, the discharges were attributed to the name of the hospital that was in effect at the time the services were provided. Patients selected for this analysis were required to meet all the following criteria to be included:

- A diagnosis of community-acquired pneumonia, either as principal diagnosis or as secondary diagnosis if the patient's principal diagnosis met specific criteria (Table A.1).
- Age at admission of 18 years or older.
- Source of admission was "Home." Patients were not included if they were admitted from "Residential Care Facilities," "Long-term Care" and "Other Inpatient Hospital Care," or from "Prison Jail" because they might have been exposed to organisms with different patterns of antibiotic resistance than individuals living in non-institutional settings. This would make their treatment more difficult.
- Date of discharge between January 1, 2003 and December 31, 2005 plus date of admission between November 1, 2002 and December 1, 2005.

1 This involved selecting all CAP records with a "level of care" code indicating "General Acute Care."

Table A.1: CAP Diagnoses Included in the Analysis

ICD-9-CM Code	Principal Diagnosis	Principal CAP Codes	Non-CAP Principal Diagnosis Codes*
480.0	Pneumonia due to adenovirus	X	
480.1	Pneumonia due to respiratory syncytial virus	X	
480.2	Pneumonia due to parainfluenza virus	X	
480.8	Pneumonia due to other virus not elsewhere classified	X	
480.9	Viral pneumonia, unspecified	X	
481	Pneumococcal Pneumonia (*Streptococcus pneumoniae*)	X	
482.0	Pneumonia due to *klebsiella* pneumoniae	X	
482.1	Pneumonia due to *pseudomonas*	X	
482.2	Pneumonia due to *hemophilus influenza*	X	
482.30	Pneumonia due to *streptococcus,* unspecified	X	
482.31	Pneumonia due to *streptococcus*, Group A	X	
482.32	Pneumonia due to *streptococcus*, Group B	X	
482.39	Other s*treptococcus* species	X	
482.4	Pneumonia due to s*taphylococcus* species	X	
482.81	Pneumonia due to other specified bacteria - Anaerobes	X	
482.82	Pneumonia due to *escherichia coli* (E. Coli)	X	
482.83	Other gram negative bacteria	X	
482.84	Legionnaires' disease	X	
482.89	Other specified disease	X	
482.9	Bacterial pneumonia unspecified	X	
483.0	Pneumonia due to other specified organism - *mycoplasma*	X	
483.1	Pneumonia due to other specified organism - *chlamydia*	X	
483.8	Pneumonia due to other specified organism	X	
485	Bronchopneumonia, organism unspecified	X	
486	Pneumonia, organism unspecified	X	
487.0	Influenza with pneumonia	X	
510.0	Empyema with fistula		X
510.9	Empyema without fistula		X
511.0	Pleurisy without mention of effusion or current tuberculosis		X
511.1	Pleurisy with effusion, with bacterial cause other than tuberculosis		X
512.0	Spontaneous tension pneumothorax		X
512.1	Iatrogenic pneumothorax		X
512.8	Other spontaneous pneumothorax		X
513.0	Abscess of lung		X
518.0	Pulmonary collapse		X
518.81	Respiratory failure		X
518.82	Other pulmonary insufficiency, not elsewhere classified		X
785.5x	Shock without mention of trauma - shock unspecified		X
786.00	Dyspnea and respiratory abnormalities - respiratory abnormality, unspecified		X
786.09	Other dyspnea and respiratory abnormalities		X
786.2	Cough		X
786.3	Hemoptysis		X
786.4	Abnormal sputum		X
038.xx	Septicemia		X

* To be used as an inclusion criterion, a non-CAP principal diagnosis must occur with a secondary diagnosis of CAP.

Cases with any one of the following characteristics were excluded:

- One or more prior admissions to acute inpatient hospital care within 10 days before the index CAP admission.
- Any diagnosis code on the index hospital record indicating trauma.
- A diagnosis code indicating that the patient had undergone organ transplant, had human immunodeficiency virus (HIV) or AIDS, had cystic fibrosis, tuberculosis, post-operative pneumonia, certain unusual pathogens as the cause of the pneumonia, or other diagnoses identified by clinical consultants to OSHPD (See Table A.2).
- Data-related exclusions. Patients were also excluded if they had unusable data reported for Social Security Number, gender, date of death, and California residence.

Table A.2: CAP Diagnoses Excluded from Analysis

ICD-9-CM Code	ICD-9-CM Description
Fungal Pneumonia	
112.4	Candida species
114.0	Primary Coccidiodmycosis
115.05, 115.15, 115.95	Histoplasmosis Pneumonia
484.6	Aspergillosis Pneumonia
484.7	Pneumonia from Other Systemic Mycoses
Other Miscellaneous Pneumonias	
136.3	Pneumocystis carinii
484.1	Pneumonia from Cytomegalovirus
484.3	Pneumonia from Whooping Cough
484.5	Pneumonia from Anthrax
484.8	Pneumonia in other Infectious Disease
73.0	Ornithosis with Pneumonia
39.1	Primary Actinomycosis
55.1	Post-Measles Pneumonia
003.22	Salmonella Pneumonia
130.4	Pneumonia Due to Toxoplasmosis
21.2	Pulmonary Tularemia
52.1	Varicella Pneumonitis

*To be used as an inclusion criterion, a non-CAP principal diagnosis must occur with a secondary diagnosis of CAP.

Outcome Measure: 30-Day Mortality

Mortality was chosen as the outcome for this report because it is important, definitive, readily available, and because prevention of some of the deaths is possible through medical interventions. Therapies that have been shown to be useful in prevention of death for CAP patients include appropriate use of antibiotics and performance of sputum cultures at admission.

The thirty-day death rate is used as the outcome measure because it is a more robust and complete measure than the in-hospital death rate. It is not biased by variation among facilities in how decisions are made about the timing of patient discharge; the use of in-hospital death rate would undercount deaths for hospitals that discharged ill patients early.

Dates of death were determined by linking the hospital discharge records to the vital statistics records (death certificates).

Risk Factors Selected for the CAP Model

Risk factors are patient factors that exist at the time of admission that may significantly influence the patient's outcome. Hospitals in which a high percentage of the patients had these risk factors (that is, hospitals with a high risk case mix) would be likely to have higher death rates, regardless of the quality of care provided.

Three types of risk factors were considered: Patient demographic characteristics such as age (Table A.3), hospitalization characteristics such as number of prior admissions (Table A.4), and clinical risk factors such as chronic liver disease (Table A.5). Acute clinical factors, such as respiratory failure or acute cerebrovascular accident, were used in the risk-adjustment model only if they were reported as present at the time of the patient's admission.

Table A.3 details the demographic characteristics of the CAP patients selected for the analysis. Of these characteristics gender and age are included in the risk-adjustment model.

Table A.3: Demographic Characteristics of CAP Patients (after exclusions)

Characteristic	2003		2004		2005 (Jan-Nov)	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*
Total Patients	78,592		66,152		64,093	
Gender						
Male	37,290	47.5	31,630	47.8	30,641	47.8
Female	41,302	52.6	34,522	52.2	33,452	52.2
Race/Ethnicity						
White	51,655	65.7	43,584	65.9	41,301	64.4
African American	6,501	8.3	5,337	8.1	5,318	8.3
Latino	12,475	15.9	10,336	15.6	10,424	16.3
Native American	220	0.3	167	0.3	155	0.2
Asian/Pacific Islander	5,893	7.5	5,150	7.8	5,153	8.0
Other	1,412	1.8	1,195	1.8	1,315	2.1
Missing	436	0.6	383	0.6	427	0.7
Age						
Mean	69.6		69.8		69.6	
Standard Deviation	17.0		16.8		17.0	

Table A.4 provides hospitalization characteristics of the CAP patients. Of these, only the number of prior discharges within the previous six months is included in the risk-adjustment model.

Clinical risk factors for the CAP model were identified through a review of recent medical literature, input from a clinical advisory panel, empirical analyses of data for CAP patients, and if the 1996 validation study found them to be reliably coded in the PDD. The clinical risk factors selected for use in the model are shown in Table A.5.

Table A.4: Hospitalization Characteristics of CAP Patients (after exclusions)

Characteristic	2003		2004		2005(Jan-Nov)	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*
Total Patients	78,592		66,152		64,093	
Admission Type						
Scheduled	1,902	2.4	1,459	2.2	1,410	2.2
Unscheduled	76,559	97.4	64,651	97.7	62,645	97.7
Missing/Unknown	128	0.2	42	0.1	38	0.1
Payment Source						
Missing	7	0.0	15	0.0	3	0.0
Medicare	52,307	66.6	44,005	66.5	42,404	66.2
Medi-Cal	9,165	11.7	7,484	11.3	7,092	11.1
Private Coverage	13,154	16.7	11,052	16.7	11,227	17.5
Worker Compensation	64	0.1	70	0.1	59	0.1
County Indigent Programs	1,266	1.6	1,057	1.6	1,013	1.6
Other Government	348	0.4	318	0.5	288	0.5
Other Indigent Coverage	203	0.3	192	0.3	148	0.2
Self Pay	1,841	2.3	1,672	2.5	1,687	2.6
Other Payers	237	0.3	287	0.4	172	0.3
Number of Prior Discharges						
Mean	0.6		0.5		0.5	
Standard Deviation	1.1		1.0		1.0	

Table A.5: Prevalence of Clinical Risk Factors in CAP Patients

Risk Factor	Prevalence (%)
Congestive Heart Failure	30.84
Asthma	12.98
Respiratory Failure	10.85
Chronic Renal Failure	8.03
Septicemia	7.74
Solid Non-Lung Cancer	7.01
Late Effects of Stroke	4.94
Blood Cancer	4.91
Chronic Liver Disease	4.50
Coagulation Defects	3.53
Staphylococcus Infection	3.46
Lung Cancer	2.67
Infection with Gram Negative Bacteria	2.17
Parkinson's Disease	2.11
Cerebrovascular Disease	1.29

The Risk-Adjustment Model

Table A.6 shows the parameter estimates, odds ratios (ORs), and confidence intervals (CIs) for the risk factors in the 2003-05 CAP risk-adjustment model. All of the risk factors were found to be statistically significant predictors of mortality except infection due to gram negative species.

The strongest predictors of death in the model were: having a diagnosis of respiratory failure (OR = 5.05), followed by diagnoses of lung cancer, non-lung solid cancer, and septicemia. The remaining predictors had odds ratios that were significant but were less than 2.0. Asthma had a protective effect (OR = 0.52). Possibly patients with both asthma and CAP are treated more aggressively and have a lower threshold for hospital admission.

Table A.6: Parameters for Model

Risk Factor	Parameter Estimates	P Value	Odds Ratio	95% CL for Odds Ratio	
Intercept	-5.9928	<.0001			
Age (per year)	0.0427	<.0001	1.044	1.042	1.045
Male	0.0709	<.0001	1.073	1.041	1.107
Septicemia	1.1265	<.0001	3.085	2.956	3.220
Respiratory failure	1.6191	<.0001	5.048	4.864	5.239
Staphylococcal pneumonia	0.3668	<.0001	1.443	1.349	1.544
Chronic liver disease	0.6071	<.0001	1.835	1.716	1.962
Lung cancer	1.2108	<.0001	3.356	3.132	3.596
Solid cancer, non-lung	0.9554	<.0001	2.600	2.481	2.724
Hematologic cancers	0.5133	<.0001	1.671	1.577	1.770
Chronic renal failure	0.2820	<.0001	1.326	1.263	1.392
Late effects of cerebrovascular accident (CVA)	0.2503	<.0001	1.284	1.211	1.362
Coagulopathy	0.6492	<.0001	1.914	1.795	2.041
Gram negative species	-0.0292	0.5424	0.971	0.884	1.067
Congestive heart failure	0.1866	<.0001	1.205	1.167	1.245
Parkinson's disease	0.2072	<.0001	1.230	1.127	1.343
Acute CVA	0.2564	<.0001	1.292	1.161	1.439
Asthma	-0.6490	<.0001	0.523	0.492	0.555
Number of prior discharges	0.1365	<.0001	1.146	1.132	1.161

Internal Validity of Risk-Adjustment Models

For this report, internal validity is defined as how well the model controls for differences in patient characteristics that would otherwise confound outcome comparisons across hospitals. Not adequately controlling for such differences may generate biased and misleading estimates of death rates. Internal validity was assessed in three ways: face validity, discrimination, and goodness of fit (i.e., calibration).

As shown in Table A.7, the current model's C-statistic was 0.80. This is similar to the C-statistics obtained in the original validation study (C-statistic = 0.79), as well as in the CAP reports for 1999-2001 (C-statistic = 0.79 without DNR and C-statistic = 0.82 with DNR) and for 2002-2004 (C-statistic = 0.80 without DNR and C-statistic = 0.82 with DNR). The goodness-of-fit statistic is significant, which reflects the large sample size and does not indicate a problem with over-dispersion.

Table A.7: Discrimination and Goodness-of-Fit Tests for Re-Estimated CAP Risk-Adjusted 30-Day Mortality Model

Number of Cases	208,837
Number of Deaths	25,389
Statewide 30-day Death rate	12.16%
C-statistic (Discrimination)	0.802
χ^2 (Goodness of Fit Statistic)	
Over-dispersion Estimate	1.2696
p-value	<.0001

There was no evidence of unusual coding practices that would seriously distort comparisons of risk-adjusted death rates across hospitals. However, we excluded three acute clinical risk factors (congestive heart failure, septicemia, and respiratory failure) from a hospital's risk-adjustment in any of the semi-annual reporting periods for that hospital when the hospital coded either all or none of these conditions as present at admission (where there were 80 or more such admissions in a six-month reporting period). These are indicated by "E" in Table A.8.

Additionally, the Patient Data Section, Healthcare Information Division, of OSHPD reported that some hospitals exhibited unacceptable CPAA indicator coding. We also excluded these hospitals from full risk-adjustment during each six-month period with problematic data. These are indicated by "X" in Table A.8.

Table A.8: Hospitals Excluded from Full Risk-Adjustment

	Reporting Period (Year - 1st or 2nd Half)					
Hospital Name	**2003-1**	**2003-2**	**2004-1**	**2004-2**	**2005-1**	**2005-2**
Bakersfield Heart Hospital						E
Barstow Community Hospital	XE					
Coastal Communities Hospital		E	E			
Colorado River Medical Center						X
Emanuel Medical Center			E	E	E	E
Encino Tarzana Regional Mc - Encino	E					
Fairchild Medical Center			E			
Fallbrook Hospital District			E			
Foothill Presbyterian Hospital					E	E
Good Samaritan Hospital - Bakersfield	XE				E	
Granada Hills Community Hospital		X				
Hanford Community Hospital					E	
Hollywood Community Hosp of Hollywood					E	
Long Beach Community Medical Center			E	E		
Los Angeles Co Harbor - UCLA Medical Center			E	E	E	

Hospital Name, Continued	2003-1	2003-2	2004-1	2004-2	2005-1	2005-2
Los Angeles Community Hospital	E		E			
Los Angeles Metropolitan Medical Center	E					
Madera Community Hospital	XE					
Mayers Memorial Hospital	X	X				
Mission Community Hospital - Panorama	E					
Mountains Community Hospital		X				
Norwalk Community Hospital					E	
Palomar Medical Center	E	E	E			
Paradise Valley Hospital				E		
Parkview Community Hospital	E	E		E		
Pomerado Hospital		E				
Ridgecrest Community Hospital	E	E	E		E	E
Riverside County Regional Medical Center						E
Santa Marta Hospital	E	XE	X			
Selma District Hospital	E	E				
Simi Valley Hosp & Hlth Svcs - Sycamore				E		
South Coast Medical Center		E				
Sutter Davis Hospital	E					
Temple Community Hospital	E					
Tulare District Hospital		E	E	E	E	E

Key: X = Inaccuracies noted by the Patient Data Section, Healthcare Information Division of OSHPD.
E = Possible inaccuracies detected by empirical analysis according to the criteria described above.

Calculation of Hospital Outcome Measures

The number of observed deaths equals the total number of CAP patient deaths that occurred within 30 days after the index admission, expressed as a percentage. The number of expected deaths at a hospital is obtained by applying the parameters (coefficients) produced by the model to each patient's data to produce a "probability of death." The sum of these probabilities across all the patients for a given hospital makes up the expected number of deaths for the hospital.

The risk-adjusted (or indirectly standardized) death rate at a hospital equals the statewide rate, multiplied by the ratio of the number of observed deaths to the number of expected deaths at that hospital (O/E ratio). The O/E ratio provides a quick assessment of that hospital's performance. A ratio that is less than one indicates there were fewer actual deaths than expected (a good result) while a ratio greater than one indicates that there were more deaths than would be expected, given the level of risk in the patient mix.

Confidence Limits for Risk-Adjusted Death Rates

Confidence limits are indicators of the reliability of a hospital's risk-adjusted death rate. In this report, there is a 98% chance that the true risk-adjusted death rate falls within the confidence limits, assuming that the model is valid. In general, when the upper and lower confidence limits are far apart (a wide confidence interval), there is more uncertainty about the specific risk-adjusted death rate that is calculated. A wide confidence interval occurs if there is wide variation among the hospital's patients and/or if the hospital reports only a small number of patients.

The exact probability of the number of observed deaths (or a more extreme number) occurring by chance, given the number of expected deaths at a hospital, was used to identify outlier hospitals. This approach differs from the more widely used normal approximation in that it relies on fewer distributional assumptions and gives better estimates for hospitals with relatively few expected deaths. If the number of observed deaths exceeded the number of expected deaths, an upper probability (p) value was computed. If the number of observed deaths was less than or equal to the number of expected deaths, a lower probability (p) value was computed. Hospitals classified as significantly "better than expected" had fewer deaths than expected and a p-value less than 0.01. Hospitals rated as significantly "worse than expected" had more deaths than expected and a p-value less than 0.01. This is equivalent to a two-tailed significance test based on a 98% confidence interval.

Results: Risk-Adjusted CAP Death Rates

As shown in Table A.9, a total of 48 hospitals were found to have significantly "better than expected" (lower) risk-adjusted death rates (RADRs), 47 had significantly "worse than expected" (higher) rates, and 259 had RADRs that were "as expected" (not statistically different from the statewide rate of 12.16%).

Table A.9: Number of Hospitals with Better than Expected, Worse than Expected, and As Expected Ratings

Hospital Ratings	Frequency
Better than Expected (+)	48
As Expected	259
Worse than Expected (-)	47
Total	354

The results obtained for all of the individual hospitals are shown in Chart 1. This chart compares the risk-adjusted death rates of hospitals to the statewide rate. There were 30 hospitals that admitted fewer than 30 CAP patients during the three-year period of this report and were excluded from the chart. These small numbers often resulted in extremely wide confidence intervals that could not be meaningfully interpreted. They are listed in Table 3 in the main section of the report.

Limitations of the Data and the Model

Quality of care is one reason a hospital's death rate may be unusually high or low. However, there are additional factors that may contribute to the results.

Additional factors might include the following:

- Unmeasured risk. Risk factors that might be important but are not reported in the patient discharge records could not be included in the model. If these additional factors had been available, it is possible that a model could have been developed to fully account for differences in the severity of patient risk across the hospitals.
- Problems with data quality. Hospitals that failed to report important risk factors or had other data quality problems could have received too little "credit" for their patient risk in the risk adjustment process. Also, if there were patients admitted from facilities such as board and care

homes or skilled nursing facilities who were erroneously reported to OSHPD as “admissions from home” they would have met the CAP definition and been included in this report.

- Limited outcome measure. This report focuses on a single measure of outcome: 30-day mortality. It does not address other outcomes such as a patient’s quality of life after discharge or likelihood of having subsequent hospital readmissions. Other organizations that monitor different aspects of healthcare quality are listed in Appendix C with contact information.

Note that this report provides information on only the care of patients with community-acquired pneumonia. It does not address the quality of care for other conditions.

Appendix B: Hospital Comment Letters

The statute that mandates public reporting of hospital risk-adjusted outcomes by OSHPD specifies that hospitals and their medical staff be given 60 days to review their performance results before the report is released to the public. Hospitals and their chiefs of staff were encouraged, but not required, to submit written comments.

Issues of Concern in Hospital Comment Letters

For the 2003-2005 community-acquired pneumonia (CAP) report, a total of seven hospital comment letters were received. Most letters concern the following topic areas:

1. Increased quality assessment activities

Four hospitals stated that while they applauded OSHPD's intentions regarding the release of this report, they were already actively engaged in other quality assurance activities. These included the Joint Commission on Accreditation of Healthcare Organization's (JCAHO) Core Measures set for pneumonia, the California Hospital and Reporting Taskforce's voluntary reporting initiative, and active promotion of practices such as oxygen assessment and administration of appropriate antibiotics within 4 hours of hospital arrival to improve the quality of care and outcomes for CAP patients. One hospital suggested that readers also consult their current performance on these other measures, some which are more timely.

> Response: The Office of Statewide Health Planning and Development (OSHPD) is encouraged that these hospitals are using this report and findings from other quality assessment activities to take meaningful steps to improve care for pneumonia patients. Consumer decision-making is enhanced by having multiple, independent sources of quality information.

2. Concerns about data quality and coding errors

Three hospitals identified staff miscoding of source of admission as a problem that affected their results in a negative manner. They claimed that a number of patients from Skilled Nursing Facilities (SNF) and "board and care" facilities were mistakenly coded as coming from home. The report methodology excludes SNF patients in calculating hospital results because these patients are considered sicker and their pneumonia may not have been community-acquired. Another hospital had also miscoded diagnoses so that important risk factors (e.g., respiratory failure, history of cancer, septicemia) were missing when the hospital results were calculated.

> Response: This is the third report on hospital pneumonia outcomes that California has issued over the last six years. Thus, hospitals have had time to put systems in place to improve coding practices at their institutions. Correct coding of "source of admission" is explained for reporting facilities in the *Patient Discharge Data Reporting Manual*. An update of the manual was mailed to each hospital in August, 1994, which explained how to code "source of admission" and subsequent training has also been provided.
>
> OSHPD, along with federal, state, local, and other entities use the patient discharge data to make assessments about hospital care in California and rely on hospitals to submit accurate data. Furthermore, once these data are submitted to and accepted by OSHPD, hospitals are not allowed to make corrections. This policy enables OSHPD to release the data in a timelier manner. Facilities that identify shortcomings in their discharge data may benefit from review of their record abstraction process and introduce changes in staff training or instructions to prevent future errors.

3. Concerns about the risk model

Two hospitals noted that a substantial number of their patients were admitted with Do Not Resuscitate (DNR) orders and that this information was not included in the risk model. In previous reports, DNR was included as a patient-level risk factor. Another two hospitals suggested that the analytic approach used for the CAP report is appropriate and provides a unique opportunity to evaluate their performance in relationship to other hospitals across the state.

> Response: The Technical Advisory Committee (TAC) for OSHPD recommended that DNR not be used in the current risk model given the bias that is introduced to hospital results as noted in pages 5-6 of this report. OSHPD is currently working with its constituents to create a new indicator for "comfort care only" that might replace "DNR."

4. Deaths that occur post-discharge

Four hospitals were concerned that patients who died in hospices, skilled nursing facilities (SNFs), and other hospitals after discharge from their hospital (but within 30 days of admission for CAP) were counted when calculating their facility's risk-adjusted death rate.

> Response: Hospital discharge practices differ widely from one institution to the other. This results in some hospitals discharging their patients sooner than other hospitals, transferring many for full recovery at another site, discharging patients to on-site facilities such as hospices, or not being able to send dying patients anywhere. Thus, use of an in-hospital mortality measure would be unfair, giving hospitals with more discharge flexibility an ability to exert greater control of their risk-adjusted mortality rate through discharge practices. As such, most experts in hospital outcomes assessment have advised that the 30-day mortality rate is the fairest measure.

5. Other

Two hospitals were concerned about the report using 'old' data when their clinical practices have improved since 2005.

> Response: The data years for the current report are based on the availability of both the PDD (OSHPD) and Death (California Department of Public Health) data. The death data files for 2006 and onward were not available at the time of data analysis and report writing.

One hospital suggested that the hospital's efforts towards patient lifestyle modification such as promoting smoking cessation and increasing preventative care efforts, which contribute to patients' survival, should be included in the model.

> Response: While OSHPD recognizes such activities as valuable additions, the mortality outcome can only be risk-adjusted for factors that can be measured and are currently available in the patient discharge abstract. Such information is not currently collected.

COAST PLAZA
DOCTORS HOSPITAL
A California Limited Partnership

December 11, 2007

Joseph Parker, Ph.D
Director, Healthcare Outcomes Center
Office of Statewide Health Planning and Development
400 R Street, Room 250
Sacramento, CA 95811

Re: Coast Plaza Doctors Hospital
Community Acquired Pneumonia Outcomes Report

Dear Dr. Parker:

We have reviewed the data of the Community Acquired Pneumonia Outcomes Report and immediately performed a retrospective review of 41 of the 57 mortalities identified in the three year report. After careful review we have identified the following issues:

1. 11 out of 41 of the cases were in fact transferred to other acute care facilities for continued care and expired after discharge. Another 10 out of 41 cases were treated and transferred to skilled nursing facilities. A total of 21 out of 41 deaths or approximately 51% expired at other facilities.

2. 13 out of 41 (32%) of the cases were designated as "Do Not Resuscitate".

3. 15 out of 41 (36.5%) of the cases were admitted through the Emergency Room from skilled nursing facilities which increases the population of patients who are at risk for Community Acquired Infections.

4. 2 of the 41 patients were brought to the Emergency Room in full arrest.

5. 34 of the 41 patients admitted were greater than 76 years of age with documented multiple system failure.

We support the State's efforts to improve the quality of care provided to patients that are admitted and treated for Community Acquired Pneumonia. We recognize the

562 868-3751 • 1 866 GO 2 COAST • FAX 562 868-3198 • 13100 Studebaker Road, Norwalk, California 90650 • www.coastplazahospital.com

States'obligation in a few instances to keep the public informed about these efforts. As an organization, we are concerned that the Community Acquired Outcomes Report is misleading and does not exclude the Do Not Resuscitate patients.

In summary, Coast Plaza Doctors Hospital believes that we provide high quality patient care to the community that we serve. We continually look for opportunities to improve the services that we provide and we want our patients and community to know how proud we are to serve their healthcare needs.

Very truly yours,

Craig B. Garner
Chief Executive Officer

CBG/tr

CORONA REGIONAL MEDICAL CENTER

Partners in Health and Healing

December 10, 2007

Joseph Parker, Ph.D.
Director, Healthcare Outcomes Center
Office of Statewide Health Planning and Development
400 R. Street, Room 250
Sacramento, CA 95811

Dear Mr. Parker:

Corona Regional Medical Center strives to be the healthcare organization in our region most concerned for those we serve, most chosen for the quality of our services, and most respected for the integrity, competency, and commitment of our employees, medical staff, and volunteers. We thank you for the opportunity to review the outcomes report on community acquired pneumonia.

We are concerned that the CAP Outcomes Report may mislead the public about the quality of care provided because of problems with the coding of source of admission, discharge diagnosis and the percentage of patients that requested hospice. Corona Regional Medical Center undertook an extensive retrospective review of the mortalities identified, several issues emerged which may have significantly contributed to the overall mortality rates.

We have identified that 20% of patients admitted to our hospital from Skilled Nursing Facilitates and Board and Care Facilities were inadvertently given codes that identified them as being admitted from home. Patients admitted with pneumonia from Skilled Nursing or Board and Care facilities are often high risk for complications and death. The inclusion of these people as cases of community acquired pneumonia along with the people truly admitted from home with pneumonia cases is a substantial bias in mortality outcomes for this diagnosis. The risk-adjustment procedure used by the State would not overcome the upward bias in mortality outcomes for community acquired pneumonia.

In addition, 8% of the patients could have been excluded base on coding errors in the discharge diagnosis, 11% of the patients included in the study were discharged to Hospice for end of life care with terminal co-morbidities.

Corona Regional Medical Center is eager to work with OSHPD to assure that the CHOP project is successful and drives quality improvement, and we will continue working to assure documentation and coding in our medical records accurately reflects the excellent care provided to our patients.

Sincerely,

Ken Rivers
Chief Executive Officer/Managing Director

Main Hospital 800 South Main Street, Corona, California 92882-3400 (951) 737-4343
Rehabilitation Hospital 730 Magnolia Avenue, Corona, California 92879-3190 (951) 736-7200
A Universal Health Services Facility • www.coronaregional.com

December 4, 2007

Joseph Parker, Ph.D.
Director of Healthcare Outcomes Center
Office of Statewide Health Planning and Development
400 R Street, Room 250
Sacramento, CA 95811

RE: California Outcomes Report on Community Acquired Pneumonia, 2003-2005

Dr. Parker,

Kaiser Permanente Walnut Creek is committed to delivering high quality care to each member we serve. We would like to take the opportunity to thank the Office of Statewide Health Planning and Development (OSHPD) for their efforts to keep the public informed of the quality of care provided at their local hospitals. We feel that it is important to reflect current health care delivery when items are publicly reported. While we recognize the efforts of OSHPD, we would like to point out that the 2003-2005 report is outdated and does not recognize total care of the patient in 2007.

We believe that there is no finish line for quality outcomes. Therefore, timeliness of reporting is essential to stay on track. Choosing to focus on treatments that improve patient outcomes rather than co-morbidity risk assessment, Kaiser Permanente Walnut Creek actively participates in the California Hospital Assessment and Reporting Taskforce which provides current information to patients on key elements that affect a patient's outcome when diagnosed with community acquired pneumonia. Pneumonia core measure interventions and treatments are endorsed by the Joint Commission. Kaiser Permanente Walnut Creek's quality of care is rated in line with the California state average. Core Measure quality of care indicators includes best practices such as oxygen assessment, blood cultures, and appropriate antibiotics received within 4 hours of hospital arrival.

OSHPD looks at co-morbidities but does not include lifestyle modification efforts and preventative care which contribute to patients' 30 day post hospitalization survival rate. In the last few years Kaiser Permanente Walnut Creek has increased it efforts to support healthy members and a health community, scoring in the 90th percentile in advising a patient to quit smoking and administering pneumonia vaccines. Decreasing the incidence of the flu is essential in controlling community acquired pneumonia, and we have made it a high priority. Kaiser Permanente Walnut Creek not only scores above the California average in giving flu vaccines to their pneumonia patients but takes pride in its efforts to vaccinate all hospital and medical center employees at no cost.

1425 South Main Street
Walnut Creek, California 94596-5300
(925) 295-4000

08915-39 (REV. 5-00)

Dr. Parker
December 4, 2007
Page 2

This year Kaiser Permanente Walnut Creek has chosen to participate in the Institute for Healthcare Improvement (IHI) 5 Million Lives Campaign Global Trigger Tool whose goal is to identify those clues associated with adverse hospital events. We are very excited to be involved with this evidence based methodology and feel it will greatly improve our patients' outcomes over the traditional co-morbidities risk assessment.

Though clinical focus, methodology, and timeliness of information may vary, Kaiser Permanente Walnut Creek and OSHPD share a common interest in improving outcomes and reducing mortality for those patients who develop community acquired pneumonia. Our physicians, nurses, administration, and staff are committed to delivering high quality patient care. Thank you for taking the time to consider our response to your 2003-2005 Community Acquired Pneumonia report.

Sincerely,

SH Small

Sandi Small, RN
Senior Vice President & Area Manager
Walnut Creek Medical Center
Kaiser Foundation Health Plan, Inc.

Sherie C. Hickman

Sherie C. Hickman
Chief Operating Officer
Walnut Creek Medical Center
Kaiser Foundation Hospital

Memorial Hospitals
Association

A Sutter Health Affiliate

Memorial Medical Center
1700 Coffee Road
Modesto, CA 95355
(209) 526-4500

Memorial Hospital Los Banos
520 West I Street
Los Banos, CA 93635
(209) 826-0591

December 14, 2007

Office of Statewide Health Planning and Development
Healthcare Quality and Analysis Division
Healthcare Outcomes Center
400 R Street, Suite 250
Sacramento, California 95811

Attention: Joseph Parker, Ph.D.

Dear Dr. Parker:

Please accept this letter as a formal response to the California Hospital Outcomes Report on Community-Acquired Pneumonia, 2003-2005 for Memorial Medical Center Modesto.

We appreciate the opportunity to review the results of this study and to make comment based on our own internal evaluation of the data and information.

Upon review of the cases included in this study and focusing on the most recent year added to the study (2005), we found that there were a number of instances where our organization missed documentation and as a result, coding opportunities in the variables that are included in the risk model for predicting deaths. Namely, respiratory failure was present but not coded in eleven records, history of cancer was located in ten patient histories within the medical record but was not coded, and septicemia was present in documentation in three records but was not coded in the medical record.

Additionally, of the deaths that occurred in the hospital for the 2005 time period, we noted that 86% of the patients had palliative care or Do Not Resuscitate orders. In the last release of this study, this variable was included in the risk model. We do believe that patients have a right to make self-determination about the intensity of care they receive based on personal wishes. We believe including this variable may have changed the probability of death value for our facility.

We also find it interesting that diabetes is not a risk variable included in the predictive model. We noted a significant number of our patients had diabetes which is strong risk factor for other chronic health issues as well as a contributing factor in how well a patient can recover for any infectious process.

Lastly, in the cases of death following hospital discharge for 2005, some patients in these deaths were transferred to hospice for end of life care.

We applaud the efforts of your organization in studying this important patient population and appreciate your inclusion of our response with the reported results.

Sincerely,

David P. Benn
Chief Executive Officer

Oak Valley Hospital District
A Division of Oak Valley Hospital District
An Affiliate of Catholic Healthcare West

November 15, 2007

Joseph Parker, Ph.D.
Director, Healthcare Outcomes Center
Office of Statewide Health Planning & Development
400 R Street, Room 250
Sacramento, CA 95811

RE: California Outcomes Report on Community-Acquired Pneumonia, 2003-2005

Dear Mr. Parker,

Oak Valley Hospital District (OVHD) is a 35 acute-bed rural facility located in the San Joaquin Valley. Oak Valley Hospital District is committed to ongoing clinical quality improvement, not only for patients with pneumonia, but all patients.

We support the analytic approach undertaken by the Office of Statewide Health Planning and Development with this project. The California Hospital Outcomes Project on Community-Acquired Pneumonia provides a unique opportunity to evaluate our performance in relationship to hospitals across the state.

OVHD utilizes continuous quality improvement methodologies to address care and treatment of our patients. Data is assessed on a continual basis and strategies are implemented and modified continuously to improve processes and outcomes. During the data collection period, Oak Valley Hospital focused on Community-Acquired Pneumonia as one of the core measures reported to the Joint Commission (JC). Overall, OVHD realized a risk-adjusted observed death rate lower than the state average. This improvement was achieved through continuous improvement activities initiated to decrease the death rate and optimize patient outcomes.

Our participation in the California Hospital Outcomes Report on Community-Acquired Pneumonia demonstrates our commitment to the residents of our community to provide optimum care.

Sincerely,

John Friel
Chief Executive Officer

350 South Oak Avenue • Oakdale, CA 95361 • Phone: (209) 848-3011

San Joaquin General Hospital / A Division of San Joaquin County Health Care Services

December 10, 2007

Joseph Parker, Ph.D.
Director, Healthcare Outcomes Center
Office of Statewide Health Planning and Development
400 R., Street, Room 250
Sacramento, CA 95811

Dear Dr. Parker:

Thank you for the opportunity to review and comment on the Community Acquired Pneumonia (CAP) data provided for years 2003-2005. San Joaquin General Hospital (SJGH) is dedicated to providing quality healthcare to the members of its community. The hospital consistently performs well in the Community Acquired Pneumonia category of the Centers for Medicare and Medicaid Services' Hospital Quality Initiative and the Joint Commission's Core Measure programs. SJGH uses these indicators and many other evidence-based programs to improve its patients' health outcomes.

San Joaquin General Hospital completed an extensive review of the 2003-2005 data contained in this report and determined that the results do not accurately represent its performance. The hospital found that 29 of the 64 patients evaluated should not have been included as CAP-related mortalities. Sixteen patients were admitted from skilled nursing facilities but were erroneously coded by hospital staff as admitted from home. After review, the hospital determined that its actual mortality rate is better than that being reported and lower than the State average. San Joaquin General Hospital is eager to work with OSHPD to correct any other errors that may have been made in documentation and coding in the medical records so that future reports accurately represent the quality care that is provided to members of its community.

More importantly, the staff and physicians of San Joaquin General Hospital are working to assure that all patients admitted with Community Acquired Pneumonia receive appropriate and timely treatment. These steps include assuring that oxygenation and blood cultures are obtained upon presentation to the hospital, that pneumococcal and influenza vaccination status is assessed during hospitalization and that proper antibiotic therapy is initiated within four hours of arrival at the hospital.

Thank you for the opportunity to comment about the CAP data and do not hesitate to contact me if I can provide any additional information.

Sincerely,

Kenneth Cohen, Director
San Joaquin County Healthcare Services

KB:cb

Post Office Box 1020 / Stockton / California 95201 / 209 468-6000

Sutter Solano
Medical Center

A Sutter Health Affiliate

300 Hospital Drive
Vallejo
California 94589

Telephone
707-554-4444
FAX 707-648-3227

December 13, 2007

Joseph Parker, Ph.D.
Director, Healthcare Outcomes Center
Office of Statewide Health Planning and Development
400 R Street, Room 250
Sacramento, CA 95811

Dear Dr. Parker;

Sutter Solano Medical Center (SSMC) appreciates the opportunity to review and respond to the Community Acquired Pneumonia (CAP) mortality data provided for the years 2003 thru 2005, which concluded that our death rates exceeded expected volumes.

Total # CAP cases 2003-2005	# observed deaths	# predicted deaths	# deaths during admission	# deaths within 30 days after discharge
336	42	37	29	13

For the reporting period, 29 of the 42 deaths occurred during the initial hospitalization where the primary or secondary diagnosis was pneumonia, septicemia, or acute respiratory failure. Of these cases, 4 were hospitalized within 30 days prior to this admission with a diagnosis other than CAP. In the remaining 13 cases where the patients expired within 30 days after discharge from SSMC, the cause of death is not provided or known, and cannot with certainty be directly attributable to care received at Sutter Solano. These are just two significant examples of numerous variables that were provided in OSHPD's CAP model.

While we applaud OSHPD's stated goal and objective of improving the care of patients with community acquired pneumonia; it is not attainable employing flawed data and methodology. The uniform application of criteria to data sets with varying underlying flaws does not normalize or standardize the data.

It is unfortunate that the data in this report is 2 years old and not reflective the hospital's current performance. Community Acquired Pneumonia is one of the core measures identified by the Joint Commission, and one to which we submit our performance data. Our core measure performance based on CMS' benchmarks for CAP has improved over the past two years to top decile, and exceeds the U.S. performance average for all clinical indicators.

In sharing the OSHPD mortality data for CAP, which can be misleading to the public, the hospital would greatly appreciate the opportunity to refer the public to our own website at www.suttersolano.org. Here they can review the most current information provided in our Quality Report listed under "About Us".

Sincerely,

Terry Glubka, CEO
Sutter Solano Medical Center

Appendix C: Additional Sources of Information

Bay Area Consumers Checkbook
52 Sylvan Way
Oakland, CA 94610
(510) 763-7979
www.checkbook.org

Rates the quality and prices of local service firms ranging from auto repair shop to hospitals

California Department of Managed Healthcare
980 9th Street Suite 500
Sacramento, CA 95814
1-888-HMO-2219
www.dmhc.ca.gov

Licenses HMOs that meet specific standards

California Medical Review, Inc.
1 Sansome Street, Suite 600
San Francisco, CA 94104-4448
(415) 677-2000
www.lumetra.com

Reviews quality for Medicare programs

California Public Employees Retirement System
400 P Street
Sacramento, CA 95814
(916) 326-3000
www.calpers.ca.gov

Publishes a report card on health plans

Office of the Patient Advocate
1-866-HMO-8900
TTY 1-866-499-0858
(1) 980 9th Street, Suite 500
Sacramento, CA 95814
(916) 324-6407
(2) 320 W 4th Street, Suite 880
Los Angeles, CA 90013-2347
(213) 897-0579
http://www.opa.ca.gov

Independent office in state government charged with informing and educating consumers about their rights and responsibilities as HMO enrollees

Joint Commission on Accreditation of Healthcare Organizations
One Renaissance Boulevard
Oakbrook Terrace, IL 60181
(630) 792-5862
www.jcaho.org

Accredits hospitals that meet specific standards

National Committee on Quality Assurance
1350 New York Avenue, NW Suite 700
Washington, DC 20005
(202) 628-5788
www.ncqa.org

Accredits health plans that meet specific standards

Pacific Business Group on Health
221 Main Street, Suite 1500
San Francisco, CA 94105
(415) 281-8660
www.pbgh.org

Works to improve the quality of healthcare for its 2.5 million represented employees, dependents, and retirees

U.S. Agency for Healthcare Research & Quality
540 Gaither
Rockville, M.D. 20850
(301) 594-1364
www.ahrq.gov

The federal government's lead agency supporting research to improve quality of healthcare

Internet links to further information about community-acquired pneumonia:

www.lungusa.org/diseases/lungpneumoni.html
www.mayoclinic.org
www.cdc.gov/nchs/fastats/pneumonia.htm

Additional copies of the Community-Acquired Pneumonia: Hospital Outcomes in California can be obtained by contacting HIRC at (916) 326-3801 or HIRCWEB@oshpd.ca.gov